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THE

EPIDEMIC FEVER IN BENGAL.

(Reprinted from the Hindoo Patriot.)

BY

DEGAMBER MITTER.

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PREFACE.

In 1873 I reprinted from the *Hindoo Patriot* newspaper certain articles, which I had contributed to it, on the subject of the origin of the epidemic fever that has devastated for several years past some of the fairest tracts of Bengal—tracts which were before pre-eminently noted for their salubrity. As the reprint was favorably received by the public, particularly by the medical faculty, I was encouraged to continue my researches, and to write a few more articles, giving fresh facts in support of the theory to which I have adhered from the commencement of the discussion. The causes which in my opinion produced the fever have not yet been removed in many of the afflicted villages; and as it is believed that the republication of all the articles in a handy and durable form might assist the public and the authorities in carrying out necessary improvements, I have ventured to issue a second edition of the pamphlet along with the later articles. It has been suggested to me that the facts on which the theory of the origin of the epidemic fever, commonly called the Burdwan fever, is based, having been searched out by myself, they ought to be stamped with my individuality, inasmuch as anonymous publications do not carry that weight which the disclosure of the identity of the investigator does. I have, therefore, been induced to drop the anonym and to come forward in *propria persona*. In doing so I owe an explanation to the reader. The theory was propounded by me when acting as a member of the Epidemic Commission of 1864 and subsequently elaborated and illustrated under the ægis of the editorial "we." I had occasion to refer frequently to what I have already said in another capacity in a manner, which has given to the references an appearance of self-praise. The suggestion to disclose my identity as the author of the articles in question came to me when the text had been already printed off, and there was therefore no time to omit the allusions to myself. The articles in their style, language, and references remain the utterances of an anonymous public writer, "and are in no wise the product of his present personality." But I hope the reader will appreciate the feeling which has induced me to accept the suggestion of revealing my identity and pardon the indelicacy, which I cannot now avoid, of publishing in my own name passages which contain allusions to myself. I should also add that if I have assumed in any of the articles a tone not quite palatable to those I have criticized, I hope it will be attributed to the heat of the controversy and not to a want of due regard for them personally.

In the preface to the first edition I wrote as follows:

"There appears now to exist a pretty general consensus of opinion as to defective drainage being the chief cause of the disease, but owing to the difference of opinion as to the seat of the defect, no good has yet resulted, and there is some likelihood of mischief being done by a wrong course of action."

The seat of the defective drainage alluded to was held by eminent men belonging to the medical and engineering professions to be the paddy fields, bheels and jullas, with which the whole country is so thickly intersected. The object of the articles under notice was to combat that opinion, and to show that the cause of the fever, whether in its endemic or epidemic form, was in the village itself and amidst human habitations, and not in the rice-fields in its neighbourhood. I am glad to observe that that opinion has been fully endorsed by no less an authority than Dr. M. V. Pettenkoffer of Munich, as will be seen in the paper marked III. in the Appendix. It also affords me great pleasure to notice that the Government of Bengal and its officers have at last, though tardily, accepted the truth of the theory, which I had occasion to propound. Sir George Campbell not only acquitted the rice-fields and jullas of participation in the generation of the epidemic fever, but even went to the length of asserting that "in these reeking swamps the human race seems to have multiplied to a greater extent than anywhere in India—perhaps in the world" (*vide* page 82.) This is a startling admission, when we call to mind the opinion previously expressed, and the action in consequence on a most expensive scale taken by the predecessors of Sir George, (*vide* pp. 9 and 10 and 43 to 48.) This change of opinion regarding a most important aspect of the question appears to have been followed by Sir George Campbell's complete conversion to the drainage theory as enunciated in my first pamphlet; and that he did not mean it to remain a barren speculation is apparent from the fact that he availed himself of the Embankment Bill, which was before the Bengal Legislative Council in the early part of 1873, to give a practical proof of his convictions by introducing a provision in the Bill empowering the District Collectors for the first time to remove "any obstructions of any kind which interfere with the general drainage of any tract of land" (*vide* Section 2, Act VI. of 1873.) This power of the Collector has been extended even to the removal of any obstruction which may have been offered by a Railroad. (*vide* Section 19.)

The Board of Revenue, in their circular, No. 3, dated May 1875, thus notice the section and draw the special attention of the Collectors to it: "The Act also contains a new feature in bringing under the control of the Collector, the management, improvement and alteration of water-courses in certain cases; and as there is reason to suppose that much of the unhealthiness of the portions of the country is directly due to drainage, the attention of Collectors is specially drawn to the power for good in this respect now placed in their hands."

It is also gratifying to observe that my theory as to the causation of the fever has been fully endorsed by Dr. Wilkie, who was charged by Government to enquire into and report on the subject (*vide* article No. 18). The learned Doctor, however, supplements the local causes of obstruction offered to the drainage by a general one, which he supposes to be the *fact* of the geological change, which has been going on in the Gangetic Delta, of which fact, however, he offers no proof whatever, and which is totally invalidated by the relative situation of the different tracts or patches of land infected by the fever in its epidemic form, and those exempt from it. I would direct the special attention of the reader to the confirmation given by Babu Annoda Prasad Kastogiri and Mr. Westland (*vide* article XIV.) to the statement I had confidently made to the effect that the outbreak of the epidemic fever in Jessore must have closely followed the continuation of the Dacca Road along it, a circumstance which, however, I had inferred simply from the fact of that road having intercepted the drainage of Jessore from its outfall the Bheel Harina. The date of the construction of the road coming so unexpectedly to light affords an additional and striking illustration of the correctness of the theory which I have ventured to propound ; and I may say that I have little doubt that the causes which I have put forward as accounting for the outbreak of the epidemic fever, which entirely depopulated Gour about 300 years ago, and in later times the cities of Cossimbazar, Kalkipore &c. &c. (*vide* pp. 17, 18, 19 and 20) will on enquiry be found to be correct. It is said that the fever has died out ; but I am sorry to state that this is not the fact. I cannot too often repeat what I believe is now accepted as an indubitable fact, that the fever which goes by the name of the Burdwan fever is not new to this country but is simply an aggravated form of that disease, which rages periodically all over the country after the close of the rains ; the cause of the fever must, therefore, be ever present in the country, though its rigor in an epidemic form can be avoided if proper precautions are taken. As to the present condition of the places, which had been formerly attacked, I would invite the attention of the reader to the facts recorded on pp. 28 and 29. Except where the cause has been entirely removed, whether by the agency of man or of nature, the villages once attacked are still unhealthy. For example the villages Raghoonathpore, Kistonagur, &c., &c., have completely recovered, the road which obstructed the drainage thereof (*vide* page 14) having been washed away by a heavy inundation of the Kana Nuddee in 1874, but the other places which had been attacked by the fell disease, have, I may say, lapsed into a chronic state of unhealthiness, though many of them were at one time regarded as the sanataria of Bengal. This is the case simply because the causes, which had given rise to it, remain there in uninterrupted operation. In those places quinine has become a part of the daily regimen of the people, and forms a part of their daily bazar expenditure.

I have already alluded to the provision in the Embankment Act of 1873 for the preservation of drainage channels and the circular of the Board of Revenue on the subject. But they are, I humbly submit, not sufficient. There ought to be a regular organized agency for the execution of this work, so essential to the health of the people. What is required is not large expenditure of money, but a careful, constant and minute attention to the drainage of the villages; and this attention cannot be secured, unless there be an agency whose duty it shall be to report every obstruction to drainage and to remove it wherever and whenever it may occur. This work, I think, ought to be performed by the Municipal, the Road Cess, and the Embankment establishments acting under the orders of some central authority, be it the Sanitary Commissioner or the Superintending Engineer. The work after all belongs to the domain of what is called sanitary engineering, and if the Government, through the Public Works Department, should make it a rule that the proper drainage of villages shall be maintained by the agencies I suggest, and should now and then make small contributions in aid of local funds for the execution of necessary improvements for efficient drainage, the object aimed at will, I am confident, be attained.

DEGAMBER MITTER.

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No. IX.—July 21, 1873.
No. X.—August 11, 1873.
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No. XII.—December 29, 1873.
No. XIII.—September 13, 1875.
No. XIV.—September 27, 1875.
Appendix.—

ERRATA.

Page 5 Line 5 for *dears* read *years.*
„ 7 „ 7 for *twenty* read *forty.*
„ 26 „ 26 for *uphonious* read *euphoneous.*
Omit the inverted commas in para 3 page 32.
Page 33 Line 35 for *situatioh* read *situation.*
„ 41 „ 35 for *alse* read *else.*
„ 42 „ 8 for *but* read *and.*
„ 47 „ 36 for *struken* read *striking.*
Insert inverted commas in para 3 page 86.
Page 89 Line 19 for *estate* read *state.*
Omit in para 3 page 91 the words "*Dr. Wilkie continues*" and the inverted commas.
Page 93 Line 1 for *he* read *the.*
„ „ „ 5 for *arned* read *learned.*
„ „ „ 7 for *upporting* read *supporting*
„ „ „ 16 for *he theorist* read *the theory.*
„ „ „ 17 for *he* read *the.*
„ „ „ 18 for *hear* read *their.*
„ „ „ 24 for *aused* read *caused.*
„ „ „ 13 *ever poison of Bengalis* read *fever poison of Bengal.*
„ „ „ 32 for *he* read *the.*
„ „ „ 33 for *oil* read *soil.*

THE EPIDEMIC FEVER IN BENGAL.

I.

We readily admit that according to his light the Lieutenant Governor is doing his best to administer relief in the epidemic districts, and we cannot be too thankful to His Honor for t, though that relief, we venture to think, he must have ere this discovered, is calculated not to restore the sufferer in any one instance to his usual state of health, but simply to enable him to tide over the crisis, and, in some cases, only to prolong for a time a miserable existence; for quinine, the chief remedy relied upon, though otherwise an admirable prophylactic, is quite powerless in coping with the epidemic fever, unless the patient removed himself from the locale of the disease, and it is questionable whether the sufferers would fare worse without it as regards perfect recovery from the fatal malady. Nothing short of thorough preventive measures, can restore the fever-stricken villages to their former healthy condition, and if, as it appears from the Resolution, published in the *Calcutta Gazette* of the 31st July last, His Honor is satisfied that the generating cause of the epidemic fever still remains undiscovered, and that no preventive measures can therefore be adopted, it would perhaps be better to leave the people to their own resources, than to forfeit the respect they entertain for the superior wisdom of their rulers by the adoption of measures, invariably unsuccessful, and not unoften extremely vexatious. We are, however, disposed to think that, amidst the many and distracting cares of his high office, His Honor has not yet been able to bestow sufficient attention to the subject; otherwise it is difficult to account for the desponding view which he takes, in the Resolution under notice, regardless alike of the facts which have been already collected, and the opinions expressed both by professional and non-professional men on the subject. A patient study of the history of this momentous question could not fail to impress upon him the fact that, however widely opinion might have differed during the earlier stages of the enquiry, there is a perfect unanimity now amongst all those who have devoted their time and attention to it, as to impeded drainage being one of the chief causes, if not the sole exciting cause, of the epidemic fever—an opinion which was for the first time put forth and was stoutly maintained by one of the members of the Epidemic Commission appointed in 1864. The medical faculty, do not any longer dispute it; and the following extract from the report of Dr. Payne on the Burdwan fever, dated the 30th December 1871, and published in the *Calcutta Gazette* of the 10th January last, affords a striking illustration of what duly qualified persons think about it :

" A crowded or dirty village here, and poverty and foul drinking water there, may, and doubtless do, by predisposing the human system to any taint that may threaten it, and impairing its resistance, determine in some degree the local features of the disease when it comes; but if such things be held up as the cause of the specific fever, contradiction will arise in the history of other years when places similarly predisposed were less severely visited, and of other places simultaneously visited with no such predisposing cause. It is necessary to regard the circumstances of the whole tract affected, and to treat such local things as incidental and capable of influencing only the incidence of the fever among classes and places.

" With this view a cause sufficiently wide and potent is not far to seek. It is one which has already been brought to notice by medical officers, and with peculiar force by Dr. Smith, the Sanitary Commissioner, and one which, I venture to think, the events of each succeeding year, tend more and more to bring into absolute demonstration, viz., the gradual conversion of a well-drained healthy and prosperous tract of country into the condition of Lincolnshire fens of many years ago, with a sub-soil water-logged and exhaling marsh poisons for the population to absorb."

The argument is irrefragable and conclusive; but we cannot help observing, that it is after all only a confirmation, and a tardy one, of what, with cogent proofs and simple illustrations, was so strongly urged in the appendix to the report of the Epidemic Commission, but which, happening to proceed from a layman and not having been subscribed to by the three medical officers included in the Commission, failed, unfortunately for the cause of humanity, to command due attention. With every deference to Dr. Payne we must, however, take leave to question the accuracy of the statement that the only cause which, but so lately as December 1871, struck him with the force of a demonstration, as sufficiently accounting for the epidemic, "is one which has already been brought to notice by medical officers, and with peculiar force by Dr. Smith, the Sanitary Commissioner." Defective drainage was doubtless incidentally mentioned as one of the many causes of the epidemic fever, both by medical officers and engineers, (*vide* Epidemic Commission's report, the reports of the Sanitary Commissioner, and Mr. Adley's report on the subject,) but it was never advanced as the sole exciting cause, except by the native member of the Epidemic Commission. In fact it is the indecision of the medical officers, and their enunciation of a hundred and one causes to account for the outbreak, (rank vegetation being held up as the chief,) which have unfortunately hitherto driven the Government to the adoption of measures, which, without in the least degree checking or abating the epidemic, have proved to be a new and fruitful source of annoyance and oppression to those already suffering from the ravages of a fell disease.

To afford a convincing proof of our position that medical men never attached much importance to what Dr. Payne would now credit them with, we give the following extract from a minute recorded by Lord Lawrence on the subject :

"The report of the commission appointed in January 1864 by the late Lieutenant Governor to enquire into the causes of the fever, describes the state of the villages to be such as justifies the wonder expressed that the people had not suffered even more extensively, but does not, I am to observe, satisfactorily account for the fact that all the causes of disease mentioned by the commission have been for years at work in many places, which until lately have never suffered, and are still in operation in many places, yet free from sickness. The only new cause suggested by the native member of the commission, Babu Degamber Mitter, as probably increasing the dampness, which the commission considered to be the main source of the disease, was the obstruction to drainage by railways and roads and the shutting up of outlets into rivers. Lieutenant Hills of the Public Works Department was accordingly deputed to report fully on the drainage of the country, and to propose a general scheme for its improvement with special reference to Babu Degamber Mitter's suggestion. In his final report, submitted in December 1864, Lieutenant Hills distinctly asserted that the Eastern Bengal Railway had not affected the drainage, and he especially mentioned some points of importance on which more or less action was taken. The report, however, contained no such comprehensive scheme as had been expected."

It is, however, not to be wondered at that, in accounting for the outbreak of an epidemic fever in a country which is under water for nearly half the year, much stress should not have been laid upon dampness or humidity of the sub-soil, which at first sight would naturally strike any man to be its normal condition. "What cares he for the dews of heaven (as the Sanskrit *sloka* has it) who has made the ocean his bed." The truth, however, is that Bengal villages are several feet higher than the adjoining country, and that unless naturally or artificially obstructed, there is on that account a peculiar facility for their thorough drainage, and this is a fact not likely to strike a foreigner readily, that it has been yet fully, realized if even by Doctor Payne himself is doubtful, as we shall show lower down.

Turning to the main question, we believe, we may now safely assume, that Dr. Payne only expresses the general opinion of the profession when, scouting with Lord Lawrence, the idea that the conditions, never absent from a Bengal village could have any thing to do with the epidemic fever, he distinctly and unequivocally maintains that it is, as its pathology unmistakeably indicates, impeded drainage solely, which "has converted a well drained, healthy and prosperous tract of country into the condition of the Lincolnshire fens of many dears ago, with a sub-soil water-logged and exhaling marsh poisons for the population to absorb." This condition of the sub-soil, no one will, we venture to think, deny, can only arise from impeded drainage, and the only question for determination, therefore, is, what is this impeded drainage owing to? The Engineers with one accord say that it is entirely due to the silting up of some of the Hooghly and Burdwan rivers, which are the drainage outfalls of the districts; and both Doctors Smith and Payne have acquiesced in their decision. Let us, however, examine the drainage system of the country, and see how far it will support this opinion. We cannot do this better than by quoting the following paragraph from the Appendix to the report of the Epidemic Commission alluded to above :

"The drainage of all the villages in the epidemic districts, as elsewhere in Lower Bengal, is effected by the water first running into the nearest paddy fields lying in the direction of their slope; thence it collects in the *beels,* from which it rushes through *khals* into larger streams; which again communicate with navigable rivers. An obstruction occurring in any one of these conduits must interfere with the drainage, and its effects are felt more or less according to the proximity or remoteness of the obstruction from the scene of its influence. Accordingly, it has been found as will be noticed more particularly hereafter, that the stoppage of the mouths of the different streams has not been productive of such serious consequences to the villages lying within their influence, as when the same occurred more in the vicinity of those villages."

Assuming the above to be an accurate description of the drainage system of the country, as we have no doubt it is, we must admit that the silting up of the rivers is no doubt calculated to interfere with the drainage of a village nearly as much as obstructions offered to it at any one of the intermediate conduits. But what puzzles us very much is that as a matter of fact the offence should be laid entirely at the door of the river, though in obedience to the laws, which the drainage of the country must obey, it is evident that obstructions might be offered to it, and with more speedy and fatal effects, in its passage from the village to the paddy-field, from the paddy-field to the *Beel,* and from the latter again to the khal. Do the Engineers pretend to say that a sufficiently high road, or embankment, crossing any one of these conduits, will not quite effectually shut out the drainage of a village, or a number of villages, lying on the upper side of the road or embankment, even if the outfall, the river, were perfectly open? And if so, have not a large number of roads been constructed in both the affected districts as railway feeders, or as ordinary high-ways, during the last fifteen years,—not to mention the railway,—most of them crossing the drainage channels of villages? Further, have not many important khals, the drainage channels of villages, been closed by those roads, unprovided as a rule with culverts at the site of those khals? and have not many of them been likewise dammed up for the purpose of retaining water on their rice-fields by the zemindars ignorant of the mischief they were thereby doing? None will venture to meet these questions with a negative, and, admitting the facts involved in them, and yet to maintain that the drainage of the two districts has been impeded and consequently the sub-soil has become water-clogged by the silting up of the rivers only, would savour very much of a reluctance to adopt in its integrity the theory propounded by the Native member of the commission. It is nevertheless a fact that while impeded drainage is now acknowledged to be alone sufficient to account for the epidemic fever, it is contended substantially, though not in so many words, that it has not been occasioned by any other of the different causes assigned by him, but by the silting up of the rivers alone. The fallacy of this assumption, however, may be easily proved by references to many instances in which the epidemic fever has broken out and in the most virulent form in villages, whose drainage outfall, *viz.* the river, is quite in tact. Take for example the case of the continuous line of villages from Ichapur to Chagda, numbering among them such thickly populated places and standing on uncommonly elevated planes, as Halisahur and Kanchrapara. These places are all situated on the eastern bank of the Hooghly, the farthest not being more than twenty miles from Calcutta. The drainage of these villages, until the obstruction offered to it by the Eastern Bengal Railway, obeying the laws so correctly enunciated in another paragraph of the Appendix referred to above, first ran in a direction away from the river on which they stand, but eventually came back to it through the two khals called the Ichapur Khal and Bager Khal. Neither the Hooghly river nor the khals have silted up, and yet the people of all those villages suffered from a severe type of the epidemic fever, which broke out, exactly in the order of time in which the railway embankment progressed and passed along their eastern borders, completely shutting out their drainage from the *Beels* Burrotee and Mothoora, Precisely the same might be said of all the epidemic-stricken villages on the other or western side of the River Hooghly, from below Bullagore to Culna. The river is perfectly open and tidal up to the latter place, and yet a number of villages, some of which might with propriety be called towns, such as Bullagore, Gooptipara and Culna, were decimated by the epidemic, from which some of the villages have scarcely yet recovered.

Such instances might be easily multiplied, proving beyond the possibility of a doubt that the silting up of rivers had least to do with the impeded drainage of the epidemic villages. In fact the fallacy of the theory that the epidemic fever in Hooghly and Burdwan is wholly and exclusively due to the silting up of the rivers would, we feel confident, have been quite transparent to its advocates, if, before hazarding it, they had the patience to consider that a general obstruction of that kind to the drainage of a tract of country must have been followed, as its inevitable consequence, by a general, outbreak of the disease in all the villages lying within it, and not, as is the fact and as is admitted in all official reports on the subject, by a most capricious and whimsical selection of some of them. Further, most of the drainage outfalls in the Hooghly and Burdwan districts silt up, or dry up, after the close of the rains, and are opened out again at their commencement in the succeeding year; so practically there is no impediment offered through their agency to the drainage of the country. We may as well here explain what we mean by the drainage of the country, as we regret to observe, there is a great deal of misconception existing on that point, leading to most erroneous conclusions.

The whole of the Gangetic delta may not inaptly be described as one swampy expanse, interspersed, at varying intervals, with villages several feet higher than the surrounding country. The surrounding country is inundated more or less during the rains; but not so the majority of the villages, the sites for which, where practicable, have been so selected as to be beyond the reach of the ordinary annual inundation. As a matter, of course, therefore, the periodical rains, unless obstructed in their course, run off from the surface of the villages in the direction of their slope to the adjoining low country. The drainage of the low parts again, *viz.*, of its arable lands, passes through khals into different outfalls. The water-levels of the khals and of rivers are, as a rule, so adjusted that it is the villages only, and not the surrounding country, that are completely drained during the rains. There is always a quantity of water left on the Sali arable lands, which constitute three-fourths of the total area of Lower Bengal. Where such lands are not so situated as to retain some water, recourse is had to embankment for the purpose of retaining it. The lands liable to annual submersion are used for the cultivation of the different varieties of amun paddy, the staple food of the country; they are utterly unfit for the production of other crops from the circumstance of their being from 2 to 16 feet under water during the rains. With the close of the rains the rivers begin to fall, and the country to be drained of the water hitherto over-spreading its surface, and contributing to the healthy growth and the bringing to maturity of the paddy crop.

By the end of October, when water is no longer needed for the rice crop, the country is completely drained of the monsoon water from over its surface, except where the lands are especially low, as in the case of *Beels*. Some of the latter, or portions of them, are never dry, though most of them dry up completely between January and March. It would be futile to deny that owing to the periodical rains and the low and swampy condition of the lands, the country is somewhat unhealthy in the rainy season, but strange to say, it is more so at its close than during its continuance,—that is the people are more sickly when the water which covered its surface has drained off, leaving the subsoil more or less moist, than when it covered the face of the country.

This unhealthiness is, however, the normal condition of the country, which it is as idle to think of escaping from, as from the scorching sun of April and May. What we are concerned with, is the intervention of the abnormal condition, which has intensified the normal unhealthiness to a dreadfully fatal epidemic. This abnormal condition is not to be looked for in the marshy character of the surrounding country, which is ever present, but in that of the villages themselves, the drainage of which, has been interfered with. We also find as a matter of fact that the paddy-fields, marshy as they are, may be rendered unusually unhealthy and at the same time totally non-productive by impediment offered, in the manner described above, to the measure of drainage which they ordinarily enjoy. A paddy-field from the surface of which the monsoon water does not retire nor dry up before April, will never yield a remunerative crop.

It should be borne in mind that when we talk of the drainage of the country, we do not mean the *complete* drainage of its arable lands or even of the villages themselves, which, owing to the physical peculiarities of the country, is simply impossible, but of such drainage only as they respectively normally enjoy. This distinction is not closely kept in view, when the engineers talk of the *Jheels, Jullas* and the paddy fields of the country as being concerned in the propagation of the epidemic fever, or when the doctors support that opinion, because they perceive the country is "in the condition of Lincolnshire fens of many years ago." Now, as a matter of fact we do not know that any part of Hooghly or Burdwan has become more fenny now and on that account non-productive than it was ever before, though we can safely testify to the epidemic *villages* having become sensibly more damp than they before were; and if, as Mr. Adley, the Engineer, seriously maintains (*vide* his report dated 25th June 1869) that the salvation of the country depends on the Jheels and Jullas with which it is thickly interspersed, being completely drained, and a belt of trees planted round villages, lying amidst rice lands, (which opinion seems to have found favor with Government as the Act for the reclamation of the *Dancoona Julla* in the district of Hooghly passed by the Bengal Council last year would indicate,) we may as well despair of ever ridding the country of the epidemic fever, inasmuch as the reclamation of *Jheels* and *Jullas* in Lower Bengal means a thorough change in the physical aspect of the country.

II.

It is observable that while Mr. Adley, having regard to the type of the fever indicating its malarious origin, could not with any show of reason refuse a place to water-logged sub-soil among the one and thirty causes to which he traces the disease, and while Dr. Payne, with a better knowledge of the pathogeny of the fever, rejects the idea of any other but a water-logged sub-soil being the only exciting cause, neither of them however, has sought for its presence in the right place. There can be no doubt as to the abnormal humidity of the sub-soil being at the root of the epidemic, but we respectfully maintain, in direct opposition to the learned doctor and the experienced engineer, that it is not the *sub-soil* of the *Jheels* and *paddy* fields that is to be looked to for its proximate and exciting cause, but that of the epidemic-stricken *villages* themselves—that the malarious poison which has contaminated the air and engendered the epidemic fever, wherever the same has broken out, is not what is evolved from the sub-soil of the jheels and paddy lands, but that of the villages, which, though at one time well-drained and dry, have been converted (in the language of Dr. Payne, though not used in reference to villages) "into the condition of Lincolnshire fens of many years ago with a sub-soil water-logged and exhaling marsh poisons for the population to absorb." To explain our views more fully, and trace the "water-logged sub-soil" to its proper site we will make another extract from the appendix to the report of the Epidemic Commission. The paragraph we quote follows a detailed statement of the manner in which the drainage of the fever-stricken villages appeared to the native member of the Commission to have been obstructed:

"I may here remark that the face of the country being perfectly flat, the drainage runs over the whole surface towards the direction of its slope, and consequently roads running transversely to it must of necessity intercept the drainage. Both the East Indian and Eastern Bengal Railways are provided with capacious viaducts wherever they have crossed what appeared to the eye as water-courses, but these are in reality khals and other large streams, which, as I have already observed, received the drainage in its flow from the villages over paddy-fields and bheels. The latter (paddy-fields and bheels) exhibit no visible signs of their being water-ways, and could not be known as such unless narrowly watched during the rains, though a road crossing them would more effectually shut out the drainage, and the evil consequences resulting therefrom would be much sooner felt, than when it crossed distant channels. Taking into consideration the number of roads which have sprung up of late, as also others in course of construction, and bearing in mind, likewise, the manner in which the drainage of the country is effected, and the difficulty thereby entailed of providing those roads with a sufficient number of outlets, it is not improbable that in the case of those villages which have not yet been examined obstructions to their drainage would, upon enquiry, appear to have proceeded chiefly from roads having been made without reference to the drainage level of the country, and without being provided with a sufficient number of water-courses."

Without denying, as a matter of theory, that the silting up of a river in this country would interfere with the drainage of some tract of it, we are decidedly of opinion that it is the water-clogged sub-soil of villages, consequent upon impeded drainage caused by other obstructions that has mainly contributed to the generation of the miasmatic poison, which has resulted in the outbreak of the epidemic fever in them. The extreme dampness which the houses in the epidemic-stricken villages present—houses which were heretofore noted for their dryness—and the disappearance or stunted growth of such of the vegetable species, as are partial to a dry soil (*assaura* and the like), and the luxuriant growth of others habitually fond of a most soil (such as Belati Bharanda), are, we think, unmistakeable evidences of the fact, and we fully agree in the statement quoted above that the mischief has been committed chiefly by roads, railways and embankments, not because as such, but when they have happened to cross the drainage levels of villages. In many instances the mischief has been likewise done by the khals or other natural channels of drainage having been dammed up by zemindars or their ryots for purposes of fishery, or for retaining monsoon water on their comparatively elevated rice lands, which otherwise would be unproductive. This practice of damming up khals, is resorted to, as well, for the purpose of keeping out water when the lands are excessively low, and when, in consequence, there is fear of the crop suffering from too much moisture. The appendix quoted above adduces a good many instances in support of this view, and we are in a position to supplement them by recording the following as the result of enquiries we have lately made.

The sub-divisional town of Jehanabad, in the district of Hooghly, is situated on the eastern bank of the Dwarkessur river. Its drainage, following the laws we have already explained, flowed into the paddy-field lying to the north-east of the town whence a part of it used to find exit through two khals into the Kana Nuddee, but the major portion, after passing over the paddy-fields, collected in the Byra Julla, and thence discharged into the Kana Nuddee through Gurbari Khal. This khal, pursuing a serpentine course, traverses a large tract of country, and, receiving the drainage of a large number of other villages, besides that of Jehanabad, opens into the Kana Nuddee at a place called Gopinathpore. Its mouth was closed by the zemindar, through whose property it passed, in the Bengali year 1273 (A. D. 1866-67) for the purpose of retaining water on the rice lands, which are very high, and from which the monsoon water ran off into the khal. This closure helped to keep the khal full, and at the same time rendered it incapable of receiving the drainage from the paddy fields, and the latter on their turn failed to draw water from the villages of which they were the drainage media. The lock up was followed by the outbreak of an epidemic almost simultaneously in all the villages of which the khal was the drainage outlet;—in a mitigated form in the year immediately succeeding the one in which the khal was closed, and virulently the year after. The following are the names of some of the many villages which have suffered from the closure of this khal—Jehanabad, Parool, Moheshpore, Gurbari, Dehi, Byra Joyrampore, and Gopinathpore.

In the same tract of country, and for precisely the same purpose, another stream, called Koko Nuddee, which was the drainage channel of a large number of villages, and which likewise emptied itself into the Kana Nuddee, was similarly closed at its mouth at Dhurrumpota in the same year, viz., 1866-67, and the same was followed shortly after by an outbreak of the epidemic fever in a number of villages, such as Kanpore, Sonagatchee, Kistobatee, Satpore, Shamdossbatee Ranhat, Hamirbatee, Pyra Dhurrempore &c., &c., &c., We should here mention that the cross dam over this khal is provided with an apology for a sluice which is so adjusted as to let out the water only when the khal is full to overflowing and when the crop of the adjoining fields is likely to suffer from excess of moisture. This of course does not help the drainage of the villages, inasmuch as the whole of this tract, is very high, and the villages situated therein are not much higher than the surrounding paddy-fields. The consequence is that the khal and the paddy-fields, being kept full, do not draw the drainage from the adjoining villages, and the lands thereof remain preternaturally moist.

In the same Sub-Division and for the same purpose, the Palalpore, Tamlabond, Arakool, Satmasha, Ryepore and Girgatolla Khals, all emptying into the Kana Nuddee, were closed,—the first four about six, and the two last four, years ago,—and the result was an outbreak of the epidemic fever in all the villages of which they were the drainage outlets. The names of some of the villages are as follows: Madhubpore, Arandi, Pertaupnagore, Arakool, Satmasha, Seepulporé, Poora, Hyatpore and Raepore. We understand that one of these Khals, viz., Girgatolla, has given way lately, the pressure of water from within being too strong to be resisted by the dam which had closed it; thus a successful effort of nature has accomplished for the villages whose drainage had been hitherto impeded, what we of late repeatedly, but vainly, importuned the Magistrate of Hooghly to do in the interest of those and a host of other villages in the Sub-Division of Jehanabad.

In the same Sub-Division a kutcha road was constructed between the years 1275, and 1276 (A. D. 1868-69); meeting the grand trunk road at Myapore, and extending to Khanakool, crossing in its course the drainage channels of many villages, and thereby intercepting their flow into the Kana Nuddee. This resulted in the breaking out of the epidemic fever in all the villages whose drainage was thereby obstructed. The disease appeared in a mild form in 1870, but assumed a virulent type in the succeeding year. The following are the names of some of the villages, which are indebted to the road for this first blessing brought in its train, to wit, Khullutpore, Saota, Tanksabee, Gourang, Syebona, Langoolpara, Rughoonathpore, Kistanagore, Gopalnagore, Narunpore, and Khanakool.

In our issue of the 5th ultimo we gave in great detail the last mentioned case, and solicited the authorities to open out the khals, and thereby restore the drainage of all the villages which had been affected by the road in question. Our excuse for having been so importunate in the matter, was the circumstance that the epidemic fever, which disappears or abates with the setting in of the hot weather to reappear at the close of the rains, might, we fondly believed, be prevented from again making its appearance in those villages by the timely adoption of the precautionary measures we had taken the liberty to suggest. Our recommendation, however, not being in favour of a chivalrous raid against shrubs and herbs, nor of enmity against receptacles of water in poor people's compounds, nor of anihilation of *pana* in old tanks, nor of any one of a hundred and one things, which readily address themselves to the senses, and are therefore seized upon with avidity by our officials, was not at all heeded, and it is now our painful duty to state that the fever has already made its appearance in many of those villages, and in a still more virulent form than in the previous year.

We are, however, glad to find that our article on the subject has been approvingly reproduced in the last number of the *Indian Medical Gazette*, with the following pertinent remarks by the Editor. "It would be interesting to learn whether other villages similarly circumstanced have *not* been visited by the fever, and whether places differently circumstanced have. It is only from particular observations of an exact kind that sound conclusions can flow." We readily adopt this wise suggestion, and have much pleasure to supply the omission by offering the following facts. The road which has caused the obstruction to the drainage, extends, as we have before mentioned, as far as Khanacool. Beyond it are situated, on the same side of the Kana Nuddee, the villages of Obidpur, Odoypur, Katadana and Ujodhya. The country in the midst of which these villages are situate, is particularly low and marshy, so much so that it is only in years of drought that the agriculturists obtain any crop therefrom, and yet the villages are quite free from the epidemic. The condition of the Kana Nuddee, again, is precisely the same in respect of these as of the neighbouring epidemic-stricken villages. The only difference which would strike any sensible man between the circumstances of the two lines of villages respectively, is that the road which crosses the drainage level of the latter does not extend to the former. The conclusion is, therefore, irresistible that their freedom from the epidemic is either attributable to their fortunate escape from the presence of the road, or their situation amidst a tract of country much more marshy than that of the epidemic villages. We need not take time to consider which of the two to choose.

It will be thus seen that places, otherwise similarly situated or rather more favorably situated for the propagation of the epidemic, have nevertheless escaped it, only because the road has not extended into them, and their drainage has not been interfered with. As for facts tending to show that places, in every respect similarly circumstanced, have yet escaped from the consequences thereof, we are not aware of any; nor, in our opinion, is such a contingency possible; when it is our firm belief, induced after a careful analysis of a number of facts collected during the last ten years, firstly, that the type of fever met with in the epidemic districts is solely due to *somethiny* in the soil—and the condition most favorable to the development of *that something,* is excessive or abnormal humidity of the sub-soil; secondly, that when such a state of the sub-soil is not the normal condition (in some places excessive humidity is natural, owing to the extreme porousness or some other peculiarity of the soil, as in the case of almost the whole district of Rungpore, where consequently this type of fever rages endemically) the cause which operates most powerfully to produce that condition is impeded drainage; and thirdly that it is the inordinate humidity of the sub-soil of towns and villages, and not of the paddy-fields and jullas, which contributes to the outbreak of the fever with epidemic intensity. Strange as it may appear, it is none the less true, that the fact, that the natural drainage of a Bengal town cannot with impunity be interfered with, which of all others should have forced itself generally into notice, is yet just the one least generally known or recognized—and it is to this ignorance or indifference, that is to be attributed, the ruin of many flourishing cities and towns, both in earlier and later times. In a footnote to the Appendix so often referred to, we find the following: "It is highly probable that the long-continued pestilence which necessitated the removal of the seat of Government from Gour to Toura, was caused by the interruption in the drainage of that city. The heavy embankment on the margin of the lake or *bheel* on its eastern extremity, which guarded the city from inundation, must have effectually shut out the drainage in its flow towards the lake."

That the hypothesis advanced in the above, to account for the pestilence which depopulated Gour about 300 years ago, has some cogent argument in its favor will appear from the following facts. Gour was situated on the eastern bank of the Ganges. Any one who has seen the interesting ruins of that once magnificent city, must have noticed the remains of a stupendous earthen embankment (not a stone one as stated in Marshman's History of Bengal) which once encompassed it on all sides—and the maintenance of which had been rendered necessary for the protection of the city from the annual inundations, to which the whole of that tract of country was, and still is, exposed, and not for the purpose of defending it from the encroachment of the river as is erroneously supposed by the same author. Its situation on the eastern bank of the river, at once indicates that its drainage-level must have had an easterly direction—while the presence of a Beel on its eastern borders, as shown in Rennell's map of Gour, is a sure evidence that the drainage of the city found its way into that Beel. As the city was embanked on all sides, its drainage must have passed into the Beel through sluices constructed in the eastern line of the embankment. To preserve intact the drainage of such a low-lying city, and at the same time to protect it from inundation must have been a problem of no little complexity in those days; and it is not at all unlikely that during the sudden and heavy rise of water in the Beel, not unusual in that part of the Gangetic valley, immense volumes of water rushed from time to time into the city through the sluice gates kept open to let out the drainage. It is not unlikely also that the rush of water on such occasions, now and then swept away parts of the embankment, and with it the drainage works, exposing the city to inundation. Indeed, this supposition is fully confirmed by the following statement in the Aini Akbari: "Here is a fine fort, to the eastward of which is a large lake, Chuttephuttea, in which are many islands. If the dams break during the heavy periodical rains, the city is laid under water." Nothing is more probable than that in the degenerate days of the Gour administration, the important question of the drainage of the city had, under the circumstance, been entirely lost sight of, in the all-absorbing thought of how most effectually to guard the city from the ravages of inundation—and it was, we believe, with that view that another line of embankment (mention of which we remember to have seen somewhere which we cannot at present recollect,) was constructed on the borders of the lake. This completely intercepting the drainage of the city, resulted in the outbreak of the epidemic fever, which, in a few years, completely depopulated it. The type of fever which committed this frightful havoc, is the same which we now find raging in the epidemic districts, with its inseparable and unmistakeable sequelæ, tumid abdomen and enlarged spleen, from which it is said even the domestic animals were not exempt.

In later days the once famous English settlement of Cossimbazar, the Dutch settlement of Kalkapore, and the French settlement of Furrasdanga, with many other neighbouring villages, were most probably depopulated under similar circumstances. The native Member of the Epidemic Commission described, from his personal knowledge, the extreme dampness which those places still presented, and ascribed it, almost instinctively, to impeded drainage; though he was evidently not then quite certain as to what had caused the impediment. The following facts will, however, throw considerable light on the subject. Cossimbazar, Choonakhally and Bhatpara, now thrown inland, were at one time situated on the left bank of the river Hooghly. Their drainage level consequently must have been towards the east, (for it should be carefully borne in mind that the banks of rivers are always higher than the surrounding country, or in other words, the country always slopes away from a river, and not towards it, and the location of a Beel, called Soloa Beel, further to the east, unmistakeably points that the drainage of those places must at one time have found its way into that Beel. A pucka road, starting from the city of Moorshedabad, passed through this tract of country, completely cutting off those places from their drainage outlet, the Beel in question. Not knowing the exact date when the road was constructed, or the exact year the epidemic broke out in those places, we cannot with certainty, as in the instances of recent occurrence we have mentioned above, connect the one with the other as cause and effect; but the similitude in all important features between the Cossimbazar case and those occurring in the epidemic districts of Hooghly and Burdwan, is such as scarcely to admit of a doubt that it was the impediment to drainage offered by the road in question which brought on the epidemic. It is remarkable that the adjoining villages lying on the east side of the road, such as Madapore, Tarakpore &c., &c., were never attacked by the epidemic, and are to this day quite free from it.

As regards the Dutch and the French Settlements of Kalkapore and Furrasdanga, those places are also situated on the same side of the river with Cossimbazar, and in a continuous line with it. The presence of a Beel, called Bistopore or Kalkapore Beel, to their south-east plainly attests that the drainage of those places must at one time have passed into it, while that of a pucca road between the Beel and the towns, and of another between the Beel and its natural outfall the Gobra Nalah, likewise attest how completely the drainage of those places had been, and still is, intercepted by those roads. All these places are still in existence, with the same type of fever prevailing in them, though the disease is not so fatal to the residents as to new-comers. Adjoining Furrasdanga, to the south, are situated, in a continuous line, the famous town of Syedabad, the old settlement of the Armenians, Khagra, the native town of Berhampore, famous for its brass cups and plates, and the cantonment of Berhampore itself. All these places drained themselves into the above named Beel Bistopore—the last through a series of tanks. In all these places, fever of the malarious and intermittent type have prevailed endemically since the last 50 or 60 years, though never in that virulent form which caused the utter depopulation of Cossimbazar, Kalkapore, Furrasdanga, Choonakhally and Bhatpara. The cause of this chronic unhealthiness is not far to seek. Beel Bistopore, which is the drainage receptacle of all these places, like Beels Chaltia, Chandor and Bhoula lying to the south and south-east of it, emptied itself through Gobra Nalla into the Jellenghee, until an embanked Pucca road from the city of Moorshedabad to the cantonment of Berhampore, constructed some 50 or 60 years, ago completely cut off its communication with this Nalla or Channel, and converted it into a lake without communication with any outfall. As is naturally to be expected from such a state of things, the Beel becomes quite full after a few heavy showers of rain at the commencement of the monsoons when having no outlet for its overflow it refuses to receive the surface drainage from the above named places, and the monsoon water consequently is absorbed in their subsoil. Hence it is that the unhealthiness of those places every year after the close of the rains, bears a direct ratio to the rainfall for the year. It is true enough that there are two sluices constructed in the embankment which protect Berhampore from the inundations of the Bhagiruthi, and are evidently designed to carry off the overflow of the Beel into that river, but it so happens that during the monsoons the water-level of the Bhagiruthi is higher than that of the Beel, consequently the sluices do not answer the object for which they were designed. It is to us unaccountable that these simple facts have never been noticed, and the drainage of the places have not been restored. This restoration can be accomplished easily, and at no great expense, simply by restoring communication of the Beel with the Gobra Nalla by means of a sufficiently wide and deep drain. Though belonging neither to the profession of medicine, nor of engineering, yet we can safely guarantee the recovery, by the places named, of their original healthiness if our simple suggestion be adopted. The improvement, we warrant, will follow within two years of the completion of the proposed drain.

We will conclude these remarks for the present by giving an instance of how an important town has partially recovered its healthiness by the partial restoration of its natural drainage. On the south and west of the river Bhoirub is situated the town of Jessore with its drainage receptacle, the Beel Harina, lying to the south-west of it. A road, called the Dacca road, constructed, it is said, about 60 years ago, runs along its south and western boundaries, intercepting the drainage of the town in its way to the Beel. How unhealthy Jessore has been for a long course of years is well known. Although we cannot ascertain the exact year in which the above road was constructed, yet we make ourselves bold enough to say that the unhealthiness in question dates within a year or two of the construction of the road. The correct information on the subject cannot, however, be unvailable to the Public Works Department, and we shall be glad to stand corrected in the matter. Cholera is said to have been first introduced into this country from Jessore, and its hand-maid, the malarious epidemic fever, after committing a frightful havoc about fifty years ago, settled down in Jessore endemically as in Cossimbazar and its neighbourhood. Not a soul could be met with there who had not a sickly tumid belly and lanky extremities to present. All the laws of sanitation known to the authorities, from the filling up of holes and dirty tanks to the cutting up of jungle, had been experimented upon, and exhausted. So much so that, with the exception of a few cocoanut trees, not a single old tree of any kind could be met with in the place within a few years of the breaking out of the disease. The natural drainage course of the place, when intercepted by the intervention of the road in question, had been attempted to be diverted towards the river on which the town is situated, but ineffectually, as the river was not tidal there, and was so constantly full to overflowing during the rains, that, instead of receiving the drainage, it would very often inundate a portion of the town itself. Thus a new evil was brought on and the authorities, leaving aside the question of sanitation, had to direct their attention as to how to protect the town from inundation. Towards the latter end, two drains were caused to be excavated, running parallel to, and at some distance from, each other, and connecting the river Bhoirub with Beel Harina, thereby affording a vent to the overflow of the river into the Beel. But the drains, in their course to the Bill, passed through the town, and thus the natural drainage of the place which had been obstructed by the Dacca road was accidentally, though only partially restored. The immediate consequence was a considerable improvement in the sanitary condition of the town which has lasted ever since. No one that we are aware of has noticed this ; and there may be persons disposed to attribute the improvement to tank-filling, jungle-cutting, and other forms of folly and extravagance which have acquired such unenviable notoriety of late. The improvement, however, will be only complete when the drainage channels of the place, which are yet directed towards the river, are diverted to the two drains.

III.

To return to the epidemic districts of Hooghly and Burdwan. From what has been already stated it is clear that so far as the Sub-Division of Jehanabad is concerned, the epidemic first broke out in the comparatively dry and elevated tract on which are situated the town of Jehanabad and a number of small villages. Two years after, it took an easterly and south-easterly course, and showed itself in villages lying in a much lower tract of country. We are afraid that facts such as these, which are always prominently put forward as important discoveries concerning the character and progress of the epidemic, and made the most of in official reports, have been seized upon by the

Lieutenant Governor to help him to the conclusions embodied in the Resolution quoted in our first article on this subject. "These facts," says His Honor, "seemed to suggest that the disease is not in the soil, or in the water, but in some way unknown marches from place to place, not sparing localities least open to sanitary objections."

With every deference to his Honor we cannot help observing, that remarks like the above only tend to show that this momentous question has not received that share of his attention which its importance unquestionably demands. If His Honor had studied the question at all, he could not have been unaware of the fact that, though travelling, the fever is never unaccompanied with such companions as ague, and enlarged spleen, both unmistakeably pointing to its malarious origin. It would not, we respectfully submit speak much in favour of any one's powers of observation, or his knowledge of the simplest truths of the medical science, if in opposition to the unanimous verdict of scientific men of all ages and countries, he should still maintain that fever of the type raging in the epidemic districts of Bengal, is not born of the soil.

We believe we have mentioned a sufficient number of facts, the accuracy of which can be easily tested by any one interested in the correct solution of the question, showing, at any rate, the remarkable, coincidence between the impediment offered to the surface drainage of the villages, and the outbreak of the epidemic fever therein. When we find, again, that such coincidence is not in conflict with the deductions of science, but, on the contrary, quite in conformity with them, it will be taxing our scepticism too much to regard such coincidence otherwise than in the relation of cause and effect. We should, however, like very much to be in possession of a sufficient number of facts whereby to prove inversely the correctness of the theory we have adopted, viz., facts tending to prove the disappearance of the epidemic from the villages with the removal of the impediment offered to their drainage. But this, we regret, we are not in a position to do, simply because Government has never thought it worth its while to try the efficacy of the suggestions offered in the Appendix to the report of the Epidemic Commission. We will, however, quote the only instance in which they were adopted, and with what result. It occurs in the following letter from Mr. Montressor, Commissioner of the Burdwan Division, to the Government of Bengal, dated the 29th November 1864, and published in the *Calcutta Gazette* of the 20th December of that year.

"I have the honor to acknowledge the receipt of your letter No. 4274, of the 17th ultimo, with annexure, and, in reply, beg to report that, in consequence of the opinion given by Babu Degumber Mitter, a Member of the Epidemic Commission, in a Memorandum appended to the report to the Commission, that the virulence of the Epidemic in Dwarbasiny was due to the obstruction of the drainage of a large Jheel to the north-east of that village, a drain was cut during the past hot weather, at an expense of about Rs. 120 to convey the water that would otherwise have stagnated in the Jheel, into a large khal which runs into the Kadermutty River; while three pucka culverts were also constructed on the Hooghly road which obstructed the drainage of the Jheel, to enable the water to drain through to the lower grounds on the other side. The total expense incurred was Rupees 313-4-6.

"Babu Joykissen Mookerjee, zemindar of the village, exercised a general supervision over the work. He considered that the quantity of water that would remain in the hollow centre of the Jheel after a large quantity had been carried off to the river would afford the inhabitants the means of irrigating their lands. The water that would collect in the centre of the Jheel, it was surmised, would not dry up, and no moist surface would be exposed to the rays of the sun.

"The benefit that has resulted from these improvements in drainage, though unquestionable, has not been such as to induce me to attribute to defective drainage alone the prevalence of sickness in Dwarbasiny. A decided improvement in the health of the villagers is reported by Baboo Joykissen Mookerjee to have taken place. There has been no fresh appearance of disease during the present year, and the only sufferers are those labouring under old fever, or enlargement of the spleen induced by chronic disease. This state of things is to be attributed, partly to ordinary sanitary measures adopted in Dwarbasiny, as well as to a greater precaution being taken by villagers in regard to their food, drinking water and clothing."

It is much to be regretted that Mr. Montressor, while acknowledging fully the success of the experiment, should nevertheless have marred its effect in the estimation of Government, by attributing the result obtained, partly to sanitary measures initiated under his auspices, which measures, however, consisted simply of the cutting and clearing of jungles,—measures pursued with equal vigour in all the epidemic villages, but with what success the repeated reports of the officers entrusted with the work fully disclose. His remarks about greater precaution having been taken by the people of Dwarbashiny, mostly or wholly poor agriculturists, about their food and clothing, are truly refreshing, and serve to illustrate how a European, spending his life in India, and amidst Indians, may yet know so little about them. Fancy a *chasa*, who, in full vigour and occupation, can earn barely enough to have for clothing a rag round his loins, and for his food two meals of rice, seasoned with a little salt, and some sort of greens, taking to meat diet and woolen garment, when emaciated to a skeleton, and reduced to the last stage of destitution by a deadly epidemic; and yet that is precisely the impression which the remarks of Mr. Montressor are calculated to produce. We must, nevertheless, give that gentleman the credit of being the only person who had the boldness to obey the dictates of common sense in opposition to the voice of science as it then found utterance through the medical faculty of Bengal. Strange to say that while the experiment which resulted in such a signal success, was not considered worthy of repetition in a single instance, the raid against jungle plants and trees, as the sovereign panacea, was pursued with unremitting vigour year after year, and the officers engaged in the work, thought they were only discharging a duty, though a most painful one, when they had to drag men, prostrated by fever, from their sick bed, to remove the jungle from their homestead, and with it, not unfrequently, their sole means of subsistence, inasmuch as the bamboo tufts and mangoe topes were then construed to be jungle;—a work, upon which, the officers conscientiously believed, depended the salvation of the Bengal villages. Indeed, such was the fatuity with which the Government of Bengal was seized, that, even so late as 1868, the all-absorbing thought was, how best to accomplish this task set by the medical faculty of keeping the pot with a thousand apertures, always full to the brim, as the following extract from a letter of the Government of Bengal to that of India, dated 16th January 1868, will show:

"It must specially be borne in mind that under the conditions of Lower Bengal, any clearance of spontaneous vegetation, however thorough, is of the most transient effect only. To cut down the jungle and under-wood is worse than useless; to root it up is extremely laborious and costly; and even when uprooted it is replaced by a no less luxuriant growth in the course of one or two rainy seasons, so that the question is not one of thoroughly clearing the villages once for all. To be effectual, active and organized measures must be continuous."

So that while village after village was being depopulated by this fatal epidemic, Government was ceaselessly engaged in this work of wholesale destruction of vegetation under the uphonious name of jungle-cutting, though no good was ever reported by any officer to have resulted from it, and though the country rang with condemnation of what the people considered to be not only useless, but positively mischievous, as calculated to denude the villages of what their common sense dictated to be a wise provision of nature for the absorption of the malarious poison, which they (the villages) must abundantly exhale, even in their normal condition. The only notice taken by the Government during this busy period of the conclusions arrived at by the native member of the Epidemic

Commission after a careful analysis of the facts collected with much labour and at great sacrifice of time, was a call upon a young engineer to report whether the drainage of the villages in which the epidemic was raging, had been interrupted in the manner stated in the Appendix to the report of the Epidemic Commission. This officer, in the extract quoted above from the minute of Lord Lawrence, distinctly asserted, in the report which he submitted in December 1864, "that the Eastern Bengal Railway had not affected the drainage."

We should have been really surprised even if a lay man had given such an opinion upon inquiry made on the subject simply with the light of common sense; but we are at a loss for words to express sufficiently our wonder at finding this conclusion deliberately arrived at by a professional man, and it is no whit lessened when we observe, that it has been coolly accepted by men who, from their long residence in the country, should have known its physical character sufficiently, to detect at once its absurdity. Any man of ordinary information must know that the river bank in all deltaic formations being necessarily high, the slope of cities and towns situate upon it, must be towards inland, *i. e.,* in a direction away from the river. It must be also evident to the most ordinary understanding that the country being flat, the drainage must run over the whole surface towards the direction of the slope. And if there is a beel, or depression, in that direction, as is generally the case, it will collect there before discharging into its natural outfall. Under such a state of things any embankment running between such places and the beel must of necessity intercept the drainage of the former in its flow into the latter, unless the embankments were provided with culverts at short intervals, and the drainage of the localities conveyed by means of a number of lateral drains into those culverts. Now it is as plain as a pikestaff, that the Eastern Bengal Railway has exactly had the effect of such an embankment, running, as it does, between Hallisahar, Kanchrapara Chagda and many other intermediate places,—all, so situated as to have the river Hooghly, on the one side, and the Beels

Burrottee and Mothoora on the other. None dares urge that the section of the railway in question lying between Hallisahar and Chagda, is furnished with culverts at short intervals, or that the drainage of the above villages is made to flow towards those culverts, and yet the engineer gave his dictum "that the Eastern Bengal Railway had not affected the drainage."

But this is not the only instance in connexion with this question in which the credulity of Government was similarly tested. When a great cry was raised in the country for wantonly neglecting the only preventive measure which could effectually check such frightful loss of life in the epidemic villages, Government deputed another engineer to conduct the same enquiries. As regards the Eastern Bengal Railway, this gentleman also reported, that it could not have intercepted the drainage of the places mentioned above, inasmuch as he had frequently passed over that road, but had never seen a heading of water at the village side of the Railway, as if nature would suspend her laws, and raise a wall of water by which to satisfy the engineer whenever he chanced to travel along that way that there *was* impediment offered to the drainage of those places, when the fact of the Railway crossing their drainage-level, as shown above, was of itself insufficient to remove his scepticism on the subject. With regard to the many Railway feeders and other roads, he reported, if our memory serves us aright, that he found them breached and levelled with the ground in so many places, that practically they could not have offered any obstruction to drainage —as if that fact of itself was not a sufficient evidence that those roads must have crossed drainage channels, and that they gave way only when they could no longer resist the rush of water, which they had hitherto successfully opposed—and as if such interception had not already done the mischief it was so eminently calculated to effect.

We will here pause to consider the force of an argument very often advanced to the effect that if the epidemic is due to impeded drainage, how is it that places recover, though no impediment to their drainage, is known to have been removed? The doubts thus raised against the theory are of easy solution. In a country where the rain-fall is periodical, and where the fall sometimes is as much as six inches or more within three to four hours, this immense volume of water must find its way into some outlet, and if any obstacle is offered in its progress, it must make a constant effort to break through the same. So long as such efforts are not successful, the places of which the drainage is thus intercepted, suffer. But when such barriers are broken through, as in the cases of many roads reported by the engineer referred to above, and the cause of the epidemic fever is thereby removed, the places begin to recover. Where, again, the barrier is too strong to be breached through, the surface water, before being wholly absorbed in the sub-soil, makes a dead effort to find some other vent which it not unoften succeeds in obtaining—more readily so, if somewhat assisted by art, as in the case of Hallisahar. When its natural drainage was impeded by the Eastern Bengal Railway, in the manner described above, it suffered terribly from the epidemic fever a number of years, because its drainage could neither break through the Railway, nor find some other passage; but at last a narrow drain was cut through the middle of the village in the direction of the river. For a year or two the drainage would not flow through it, and it used to silt up, because the slope of the village was in a different direction, and because moreover, the drain had not been cut deep enough, nor a sufficient slope given to it in the direction of the river. When, however, these defects were remedied the drainage of the place began to rush through it, and the drain from being a narrow channel of four to five feet in breadth when it was first cut, has now assumed the dimensions of a broad canal. The sanitary condition of the place no doubt has since considerably improved, though far from being yet restored to its former healthy state. From personal observation and enquiry we believe this to be the correct solution of the problem, and not because, as some would suppose, the epidemic was erratically disposed, and impatient of a long sojourn in any one place. We may also remark that malaria, like many other poisons, is not so fatal to those who are gradually accustomed to it as to strangers. A village, therefore, though infected with the epidemic, may not, after all, be so deadly to its residents as to new-comers; though to pronounce such a village as having recovered from the epidemic will be as correct, as to declare opium to be quite innocuous, because a Chinaman can with impunity swallow a sicca weight of it.

IV.

We have been favored with a copy of Mr. Metcalfe's report on the state of public health in the district of Burdwan during August last. We find that he has, in a very marked manner, borne testimony to the truth of certain significant facts, which we mentioned in our epidemic articles published in September and October last. Quoting, from the *Patriot* of the 16th September last, what we wrote about the excessive dampness which the houses in the epidemic-stricken villages present, as a necessary consequence of impeded drainage, Mr. Metcalfe writes as follows:

" I have quoted this extract as it describes the popular view of the disease amongst those who are most interested in it, *viz.*, the sufferers.

" 47. The excessive dampness of houses and tenements as compared with former years is undoubtedly a fact.

" 48. If a commission were sitting to inquire into these facts, evidence might be produced in abundance to show this.

" 49, It is notorious that in the native quarter pucca houses, (this is evidently in reference to the town of Burdwan) habitable in 1862, are uninhabitable now.

" 50. That the population have taken largely to sleep on cots to avoid the dampness of the floors."

At about the end of paragraph 9 he says, "the fever has hung about Kanoo Junction, and still hangs there in the most persistent manner."

Para 10. "I attribute this entirely to want of surface drainage."

It is remarkable, however, that, after subscribing in the most unequivocal manner to the above facts and opinions, unmistakably pointing to impeded drainage as the cause of the epidemic fever, Mr. Metcalfe should still cling to the travelling theory, and seek to adduce the following, as facts, unquestionable and incontrovertible, in support of it:

"63. It is not possible that after all we have been looking too near at home for the causes of this deadly disease."

"64. We know that it has come to us creeping over the land from the east, gradually but surely.

"65. Jessore, Krishnaghur, Hooghly, all felt its effects before it reached Burdwan. It halted for a time on the eastern bank of the Bhaugiruthee, and then crossed the river, ravaging Poorbusthaly near Culna. It took upwards of two years to travel 35 miles; again it halted on the eastern bank of the Damooda, then crossed to the west."

Now, Mr. Metcalfe does not pretend to maintain that, either in Jessore, or in Krishnaghur, the epidemic observed an even and fixed course, and he must have watched the rise and progress of the fever in the districts of Hooghly and Burdwan to very little purpose, if he is not cognizant of the fact, that it has been very whimsical, indeed, in the choice of its victims in those districts, and that if it has followed any course at all, it is a most erratic one indeed. In fact he furnishes in the very report we are commenting upon a fact, which, while it is quite subversive of the travelling theory, affords strong corroborative evidence of the truth of the drainage theory. Speaking of the village of Belan in the Bood-Bood circle, Mr. Metcalfe, in para. 18, says:

"So that there we have in the midst of an epidemic-stricken tract one village with all its inhabitants healthy, no deaths, no chronic sickness, no misery in every house-hold, the people breathing the same atmosphere as thousands of their fever-stricken fellow-creatures, and the sole perceptible difference is that *the village is dryer*."

The italics are Mr. Metcalfe's own. Now what can be a better proof than what the above extract furnishes, in support of the opinion that the cause of the epidemic is local, and not general, as Mr. Metcalfe would nevertheless contend for. If the travelling theory has any basis to rest upon, it is this, that the epidemic, which is said to be travelling, is contagious, and that the contagion is spread by means of the atmosphere. Without waiting to enquire why, if the contagion was communicated through the medium of the atmospheric current, it should not at any one time obey an even course, but that the poison should be wafted simultaneously to totally different points of the compass, and to places situated at long intervals from each other, as we can easily prove by citing a number of instances, and of which fact, it is impossible, Mr. Metcalfe can be unaware. For instance, we may ask why should Belan have escaped, when according to his own showing, the surrounding country was infected? Does not that very fact show that the cause must be local and not general? And that it is so, is proved by the report of Dr. Gupta, which immediately precedes para. 18 in which the statement is made. Dr. Gupta says:

I paid a visit to Belan. It is just like the other villages, with one striking difference, that nearly all the tanks are good. The men, women, and children looked healthy. *The soil appears dry* (the italics are in the original) : the ground is not higher than the surrounding country. Some of the tanks have overflowed their banks and flooded the roads. The houses are generally kutcha, with a few exceptions. Last year the village was not quite free from sickness, but there was no epidemic ; a few cases of fever occured with a few deaths."

" It is evident from the above that the drainage of Belan is quite intact, at all events it has not yet been materially interfered with. The drainage of the village, it appears, first flows into the tanks (as is the case in hundreds of Bengal villages) which when full send the overflow to its natural outfall, and though a road intervenes, it is evidently not high enough to offer any effectual obstruction, as we find that it is flooded in the passage of the drainage to its outfall. The above facts sufficiently, explain why the soil of the village appears dry, and how it has escaped the epidemic. The case would have been quite different if the road had been higher than the level of the village, and at the same time strong enough not to give way to the rush of the drainage when seeking its outfall. We have not seen Belan, but, judging from the geographical features of Bengal villages, we doubt not that it is separated from the surrounding epidemic-stricken villages by extensive tracts of rice fields, which are quite enough to offer a sufficient protection against the dissemination of the malarious poison from the places where it originates.

That the immunity enjoyed by this village cannot be due to its being blessed with a supply of better drinking water than the surrounding villages, is evident enough from the case of Ballagore, Somra, Gooptepara, Culna, Hallisahar, Kanchrapara, and Chagda. All those places are situated on the banks of the Bhagiruthee, and obtain their supplies of drinking water from it, and at points much higher, and therefore purer, than that from which Calcutta derives its present supply, and yet but a few years ago all those places were decimated by a deadly epidemic fever from which some of them are still suffering. We are far from underrating the value of wholesome water as an important hygienic agent and will never cease to bless Mr. Schalch for conferring upon us this inestimable boon. We are fully aware that unwholesome drink, by disturbing the digestive functions, may bring on dysentery, diarrhœa, and many other cognate diseases; but we unhesitatingly scout the idea that it will account for the outbreak of the epidemic fever of the type now raging in the districts of Hooghly and Burdwan.

We will conclude our remarks on this portion of Mr. Metcalfe's report by citing a similar instance of exemption precisely under similar circumstances. We allude to the village of Chandoor, which is situated on the eastern bank of the Dwarkessur river, within a short distance of the Sub-divisional town of Jehanabad, and environed on all sides, except on the west, by epidemic-stricken villages. Its exemption, however, is not due to accident, but to the fact of its situatioh on a particularly elevated plot of land, removing it thereby from the influence of those obstructions, which, as we showed in our issue of the 16th September last, have effectually shut out the drainage of the surrounding comparatively low-lying villages. It is quite clear, therefore, that the surface drainage of Chandoor must, owing to its advantageous position, find its way into the country lying several feet down below, unless obstruction to it should be offered somewhere in the village itself.

Mr. Metcalfe is sadly unfortunate in his statement of those facts from which he wishes to draw support to his travelling theory. The epidemic did not halt on the eastern bank of the Bhagiruthee, as if it were deliberating as to which villages to seize on the other side, but it raged most virulently on either side, so far as certain villages are concerned, precisely at the same time. For instance, Bullagore, Somra, Gooptipara, and Culna, situated on the western bank of the Bhagiruthee, were overtaken simultaneously with Hallisahar, Kanchrapara, and Chagda, lying on its eastern bank and along the line of the Eastern Bengal Railway—while places like Chatra, Tribeni, Baggati and Pandua, situated along the line of the East Indian Railway, had been attacked, and more than half their population carried away before the epidemic had reached the places named above, and situated on the eastern bank of the river. So that, if the travelling theory was to be believed, the epidemic must have been travelling backwards and forwards in a most random style indeed.

Then, again, Mr. Metcalfe asks: "If local causes alone regulated this ague, why has it left Culna and Poorbusthooly? What possible effect could this silting of the Kannookhal river, miles away, have upon a town situated on the high bank of the Bhaghiruthee, like Culna?" We do not pretend to know who it was that had furnished Mr. Metcalfe with such an easy means of demolishing the drainage theory, but if he will take the trouble to read the article headed "the epidemic fever" in our issue of the 9th September 1872 (Article I.), he will find, as we have therein shown, that it was the Railway feeder from Pandua to Culna that had caused the mischief, by crossing the drainage channel of a line of villages including Culna, and we would respectfully ask him to correct us if we are wrong in this statement. He will, on enquiry, find that the epidemic broke out in those villages exactly in the order of the time that the road, in its progress, crossed the drainage channel of each. We cannot answer for Poorbusthooly, not having seen the place of late, but as regards Culna Mr. Metcalfe will, on enquiry, find that the epidemic left it simultaneously with the removal of the cause thereof. The road, when first constructed, was both high and strong, and offered an effectual check to the drainage of all the place lying immediately to the east of it, in finding its natural outle which is beyond the road and towards the west. The road is a kutcha one, and, fortunately for the surviving population of the villages, the repairs to it not having been annually attended to, several breaches have been made in it by the constant rush of the impeded drainage against it. The periodical rains have also contributed their aid in washing away the earth, and thereby reducing the height of the road. So that it can no longer offer the same obstruction to the drainage of the villages in question in making its way to its outfall, either through the breaches, or by overtopping the road as it did before. Thus, the epidemic did not leave Culna because it was tired of it and wanted a change, but only because the natural drainage of the place having been accidentally restored, it was deprived of *that* from which it drew its nourishment. We would here correct a mistake that we made in our article on the subject, which appeared in our issue of the 9th September 1872 (Article I.) We there said that the feeder road from Pandua to Culna had interrupted the drainage of Ballagore, Somra, and Gooptipara as well as of Culna; the fact however is that that road obstructed the drainage of the last named place only, and not of the other three. A kutcha road, commencing from the old dawk road at a point little below Domoordah, and meeting it and the Pandua feeder road at Inchoora, had done the mischief so far as those places are concerned. Both the roads were commenced upon in 1860-61, and the epidemic broke out in a virulent form in all the places lying on their track in 1863-64.

With a view to test if it was true that the sub-soil of the epidemic villages had been rendered humid in consequence, as it had been alleged, of the impeded drainage, Mr. Metcalfe writes that he initiated the following experiments:

" 54, One drain, more than an inch (mile) in length and in places sixteen feet deep, has been cut, running past the paddy field, and along that *bete noire* of the subsoil theorist, the line of Railway embankment, and yet no moisture has oozed out of the side cutting at all."

" Near the village of Jogootee a cutting has been made fifteen feet deep with exactly similar results.

" 56. The bed of the Banka is twelve feet below the level of Burdwan town, and wells have been sunk in it eight feet below that again, no side ooze has been in either case perceived.

" 57. In preparing foundations for the anicut in the Banka river, when the cutting had been sunk some four feet into the bed, or sixteen feet below the surface of the town, there was undoubtedly a considerable ooze, which became a regular flow. This appearance was for a time corroborative of subsoil theory till the owner of a distant tank cruelly destroyed the illusion, and complained that it was being steadily drained off.

"Again, two deep tanks have been sunk close to a large patch of paddy land, but we failed to gather any water from side draining, and yet it is undoubtedly true that the subsoil of parts of the Burdwan district is moist."

We are only surprised that Mr. Metcalfe should have ever thought that the kind of experiments he was engaged in, could possibly gauge or even indicate, the presence of moisture in the subsoil. He does not say at what time of the year these boring and cutting operations were executed. If they were undertaken at any time after February as most probably they were, it was as reasonable to expect that such cuttings would in any part of the district of Burdwan draw much water from the adjacent lands, as it would be to obtain blood out of stone. In fact at no time of the year after September could such cuttings be depended upon, as offering an infallible test of the presence, or otherwise, of moisture in the subsoil of a Bengal village. What is already absorbed in the subsoil will not come out in a stream; nor ooze out in profusion. That can only occur when the monsoon water, instead of being gradually absorbed in the subsoil filters down into a subterranean spring, and that spring is successfully tapped. But in that case there would be no epidemic, for the sub-soil, freed from moisture by the process of filtration or drainage, would no longer evolve that *something* which is its generating cause. It should not be forgotten also that every village in Lower Bengal is more or less humid after the cessation of the rains, from the beginning of October to the middle of December—more so than during the continuance of the rains, and fever, precisely of the epidemic type, though not in an aggravated form, is more or less rife throughout Bengal during those months, than at any other time of the year. Hence the period is characteristically described in our country by the term of Jamastaka—meaning that during that period all the eight portals of the mansion of Pluto are open to receive the dead. The same cause, therefore, *viz.*, the humidity of the sub-soil and the evolvement of that *something* in consequence thereof, which under its normal condition favors the advent of the intermittent type of every year in a mitigated form, when intensified as would necessarily be the case when the humidity of the soil is aggravated by obstructions offered to the surface drainage of a village during the rains, and thereby allowing it to be wholly absorbed in the sub-soil, would usher in the fever in an epidemic form. We would entreat those who are engaged in enquiry into the cause of this epidemic to bear this significant fact in mind, inasmuch as all their investigations are sure to prove disappointing, if they start with an idea that the fever met with in the epidemic villages is a stranger to the land.

We have no means of measuring and denoting in figures the relative proportion of humidity, which would distinguish the abnormal from the normal condition. But that the epidemic villages are at present more humid than they ever before were, is universally acknowledged, and no better proofs of the fact could be adduced than those offered by Mr. Metcalfe himself in the report under notice. Mr. Metcalfe would have done better service to humanity if, instead of wasting his time and energies in these so-called scientific enquiries, he had devoted his attention to the investigation of those startling facts which we have noticed in the columns of this paper from time to time, and which for ready reference we intend shortly to republish in pamphlet form. What for instance could be more suggestive than that the closure of two khals should be followed in the very succeeding year by an outbreak of epidemic simultaneously in a hundred or more villages, and those khals well known to every chasa of the locality to be the drainage outlets of the villages—though we know to our cost it will puzzle a professional Engineer to discover the fact? What, again, can be more remarkable than that the construction of a single road would be followed immediately in its train by the appearance of the epidemic fever in all the villages, numbering about a hundred, the drainage channel of which happened to be crossed by that road? We have mentioned many such instances, which, we again repeat, Mr. Metcalfe would have done well to have enquired into, for we feel certain that a careful, honest, and unprejudiced enquiry cannot possibly leave a doubt in any mind open to reason and unfettered by professional prejudices, that the connexion between the epidemic and impeded village drainage is as intimate as between cause and effect. We are glad to notice that Mr. Metcalfe intends to prosecute, during the present cold season with the aid of an Engineer, the enquiries we have so repeatedly called for though we cannot help saying that he might have conducted the enquiry indicated by us much more speedily, and at the same time more satisfactorily, without any such aid. The enquiries he is called upon to prosecute are—

1st. Whether the obstructions mentioned by us do, as a fact, really exist, and whether they really impede the drainage of the villages named by us, and of many others not so mentioned?

2nd. When were the several obstructions offered?

3rd. When did the epidemic first show itself and when did it break out in a virulent form in all the villages, the drainage of which was interfered with by those obstructions?

The second part of the first question might appear to necessitate the aid of a professional man, but we can, from our own knowledge and experience, assure Mr. Metcalfe that an intelligent chasa, or field-labourer of the locality, will be able to give him more correct information about the drainage course of a village from his every-day actual observation, than any engineer with all the levels which hemight scientifically take, as we have elsewhere illustrated by reference to the palpable mistake made by Lieutenant Hills and also another Engineer when on the requisition of Government both of them reported that the Eastern Bengal Railway had not interfered with the drainage of a line of villages from Ichapore to Chagda lying on the west of it. The other questions are purely those of facts. So that, there will be a great saving of time, if the enquiries were held independently of any professional aid, which, we are sorry to observe, has hitherto had the effect more to mystify than to clear up the question at issue.

While upon this subject we would take the liberty to point out the confusion of ideas involved in the last three sentences, with which the *Friend of India* closes its short leader in its last issue (26th December 1872.) on malarious fever in the district of Hooghly and Burdwan. "Until," says the *Friend,* "the saucer-shaped depression between the Damooda and the Hooghly is relieved, as it used to be, by opening the natural Khals we can expect little mitigation." We presume that the above suggestion is not made without a full knowledge of the drainage system of the country. Those saucer-shaped depressions, which are no other than Beels, are to be found interspersed in great numbers in every district of Lower Bengal, and they are the drainage media of the country. It is into these Beels the surface drainage of the country first collects, to be let out again through Khals into its natural outlet, a running stream. These Beels cannot receive the drainage of the adjoining villages as well as the superfluous moisture from the paddy fields unless the Khals, through which they discharge their overflow into a large stream, are preserved intact. So far the *Friend* is perfectly right. The Beels must be relieved, or the drainage system of the country will be at a dead-lock. Some of these channels have silted up, as in the case of Kana Nuddee, though without as yet interfering in any perceptible degree with the drainage of the country, inasmuch as one of its mouths is opened out during the rains, and no impediment is therefore yet caused to the discharge of the surface drainage, which it is intended to carry. There are other such khals in both the districts of Hooghly and Burdwan, which, though they silt up after the close of the rains, are yet opened out during the rains, and are thus enabled to perform their allotted function. But it is the closure of these Khals by means of roads and embankments and by Zemindars for the purpose of retaining water on their paddy fields, when the same are too high otherwise to retain it, as we showed in our issue of the 16th September 1872 (Article II.), which chiefly cause the mischief we all lament. Admitting as a fact that the surface drainage of the country is necessarily interfered with, if the Beels are not relieved, the *Friend* cannot but also admit that it (the surface drainage) may be also interfered with before its passage into the Beels. A road, crossing the drainage channel of a village, must, by preventing its flow into the Beel, as effectually shut out its drainage, perhaps more so than if the Beel had been disabled from receiving it by reason of its being full for want of relief. The *Friend* must be aware that a number of roads have sprung up of late in the shape of district roads, railroads, and their feeders, and that it is not unreasonable to suppose that many of these roads have crossed the drainage channels of villages. So that it is not the Khals alone that are at fault, but that the roads have also much to answer for in causing obstructions to the drainage of the country. But what appears to us as passing strange, and as betraying a singular confusion of ideas, is that the *Friend* should, immediately after recommending the conservating of the drainage by keeping open the Khals, break out into the following : " The country is water-logged. It requires the same subsoil drainage which converted the Fens of England into rich pastures and prosperous villages." Now, although many villages in both the districts of Hooghly and Burdwan are suffering from the epidemic fever, where, we ask, does the *Friend* discover in the arable lands of those districts a parallel to the fens of England? Though we cannot say of our own personal knowledge, yet we have heard that the fens of Leicestershire did not produce a single blade of grass. Can the *Friend* say the same of any part of either of the two districts named? Are not the crops there now equally luxuriant as they ever were? though we know of instances where the crop could not be reaped, because those that had sown it either died off, or had become too much prostrated by fever to gather the harvest, as in the case of Wobidpore near Khannacool in the Sub-Division of Jehanabad. But we admit that the soil is water-logged. Now, how will the *Friend* explain this paradox of fens being exceedingly fruitful? We will solve the difficulty for him. In the first place, he must remember the old adage that what is meat to one may be poison to another. What proved to be so destructive to the crop in the fens of England, is food and nourishment to the paddy crop here, and, we believe, he is aware that in Bengal recourse is had to bunding in order to hold the monsoon water in the rice-fields, or else there is no crop. Whatever may be the quantity of moisture in the rice-fields till September, those fields begin to dry up from October, and by April and May they are quite dry, so much so that they present cracks everywhere. It is when the fields do not dry up at all that they fail to yield any crop—and then they might be pronounced water-logged in the English sense of the word. No part of Hooghly or Burdwan has, however, yet come to that pass. Where then is the necessity for subsoil drainage? But suppose any portion of the districts come to that pass, the remedy does not lie in subsoil drainage, but in the restoration of the natural surface drainage of the country. Secondly, what is food to our crops is deadly poison to us. What is so carefully held in store for the nourishment of the rice plants, must be as carefully let out of the villages, or alse the fever, which, as we have before observed, is endemic here from October to the middle of

December, will assume an epidemic form. To account for the epidemic you are not, therefore, to look to the soil of the rice-fields, or of the Beels, but to that of the villages themselves—and if it is water-logged, the true remedy, as in the other case, is to be found in the removal of the obstructions which have been offered to the drainage course of a village, and not in subsoil drainage. For however humid or water-logged the soil of a village may be, it will, under the scorching sun, but without the aid of any subsoil drainage, be perfectly dry by April, when also epidemic fever, however virulently it may have been raging, will of itself begin to abate. To prevent a recurrence, we have only to restore the natural drainage of the villages, and they will, without any other treatment return to their normal condition. In fact the application of subsoil drainage to Bengal with its periodical rain-fall of 80 inches, the rivers full to overflowing during the monsoon, and three-fourths of its arable lands under water at least during four months of the year, and relying upon it as a sovereign remedy for the eradication of the disease, appears to us is as reasonable as the conduct of the man who waited in expectation of fording the river when it would become dry during ebb-tide. The undertaking recalls to our mind the feat of our ancient sage Agastya, who is said to have brought the sea into the hollow of his palm and then drunk it off.

V.

In our issue before the last we attempted to show, in reply to certain remarks in the *Friend of India* of the 26th ultimo, that if the epidemic now raging in the district of Hooghly be attributed solely to the " saucer-shaped depression between the Damooda and the Hooghly," the remedy lay not in the application to the Beels and rice-fields of Bengal of subsoil drainage, which had so successfully reclaimed the fens of England, but in the opening out of the natural Khals, which had hitherto relieved this saucer-shaped depression of its overflow, and thereby enabled it to perform its allotted function in the natural drainage system of the country. We have a few words to add to it. We are surprised that a gentleman, like the editor of the *Friend of India,* who, by reason of his long residence in the country, claims the privilege of talking authoritatively on every subject connected with it, should not have been sufficiently impressed with the striking fact that the geographical features of Bengal are quite different from those of England, and the former has consequently a drainage system peculiarly her own, which would be as out of place in the latter as the subsoil drainage of the latter is in the low-lying and periodically-flooded lands of the former. In fact, to our "uneducated" common sense an attempt at such substitution appears to be no less insane than an attempt to grow wheat on lands which we—ignorant Bengalis—do not yet know to turn to better account than to sow paddy with. But we must admit that the *Friend* is not the only person who fancies that it is to subsoil drainage we should look for the eradication of the epidemic fever. For, strange as it may appear, this very scheme was seriously propounded, and strongly recommended, by the Civil Engineer, Mr. Adley, who had been deputed to report upon the feasibility of *draining* the swamps or beels west of the town of Serampore, and made the basis of legislation in the Bengal Council. Tired of jungle-cutting, which had been prosecuted with unabated vigour, but unattended with any beneficial result ever since the commencement of Sir Cecil Beadon's administration, Sir William Grey seized upon this idea with all the avidity characteristic of the earnestness and sincerity which were always conspicuous in every thing he undertook for the good government of the country. It was in June 1869 that Mr. Adley submitted his report on the drainage and reclamation of the jhlla or swamp west of Serampore, and both the Governments of India and Bengal were so captivated by the prospect it held out of combining in this country improved agriculture with drainage, which they knew were inseparable in England and Ireland, that they determined upon giving it a practical effect, and towards that end a Bill was introduced in the Bengal Council on the 3rd December 1870. The discussion on the principle of the Bill took place on the 10th of that month, and our review of the literature of the epidemic fever would be incomplete, were we to omit to transcribe what was said on the occasion by the Hon'ble Degumber Mitter from his place in the legislature. We quote the following from his speech on the subject:

"Now the whole country—he (Babu Degumber Mitter) meant Lower Bengal—was full of these bheels or depressions, which were the natural receptacles of the drainage of their surrounding lands. At the lowest estimate he would take a hundred of these bheels to every district. In the eastern districts most of these hollows communicated directly with navigable streams during the monsoons, when they were from twelve to fifteen feet under water. These, he sincerely trusted, it was not pretended should be drained.

"But suppose some of the inland bheels, as in the district of Hooghly, were capable of being drained, how were the hollows to be filled up, except by a gradual process of silting up by the sewage of the surrounding country finding its way into them? and when, after a series of years, they had silted up, they could not present a more elevated surface than the adjoining lands. But unfortunately for Mr. Adley's scheme of drainage, and the removal thereby of the cause of the epidemic, the adjoining lands happened to be paddy lands over which water lodged to the depth of two or three feet, and which continued in that state for at least four months in the year, and these lands, according to him, were equally productive of miasm. In his list of causes were found "moist lands and meadows, or a water-lodged subsoil when dried up under the sun;" again, "rice grounds, especially in jullahs, where the ears of the crops only are cut off, and the stalks left to rot in the water,—thus adding fuel to the fire." Now, was Mr. Adley prepared to drain these rice lands, which constituted nine-tenths of the culturable lands of Lower Bengal, and deprive the people, if possible, of the only food crop the lands were capable of bearing? But what made Mr. Adley so sure that these *bheels* and "rice grounds" were the causes of the epidemic fever? Was not Calcutta within a mile of an extensive salt-water lake, which according to him, was still more generative of malaria than a fresh-water one, and had it notwithstanding within the memory of the present generation ever suffered from a type of fever which was met with only since a few years in some of the most healthy localities of Bengal, and which decimated in the short space of a year half the population of a village where it broke out? On the contrary, was not Calcutta particularly healthy of late, and its death-rate reduced to that of some of the English towns, and yet was not the salt-water lake in existence in all its glory? But even as regards the villages surrounding the Dankoonee bheel or jullah, the drainage of which was considered so imperative in the cause of the epidemic that an estimate had been already made, and the drainage-operations of which would perhaps be commenced upon immediately on the proposed measure becoming law, did we find anything like an epidemic there? In appendix B, subjoined to Mr. Adley's report, it was stated that in 26 villages surrounding that *bheel* the mortality in three years was only 2,145 amongst a population of 10,949 souls or about 6½ per cent, per annum; whereas, in an epidemic village, one-third, and even half, the population was carried off in one year. But the idea that the *bheels*, which had existed since the formation of the country itself, and the rice lands, which meant the surface of the whole country, were the generating causes of the epidemic, and that they must be drained if the epidemic was to be checked, was so preposterous, that he would not detain the Council with further remarks on that head. Nothing was so natural as that those ugly and offensive sights—the stagnant bheels, rank vegetation, and paddy-fields immersed in water—would suggest themselves to a European, unaccustomed to those sights, as the most probable causes to account for a terrible epidemic; but he (Babu Degumber Mitter) was really surprised to find that local conditions of soil and climate, inseperable from us as our very skin, or perhaps more so, should be deliberately and professionally pronounced as causes adequate to account for a phenomenon of recent or casual occurrence, and the same gravely proposed to be adopted as the basis for action. If we were incompetent to grapple with this fell epidemic, as we had evidently proved ourselves to be, let us in all humility admit our inability; but he protested against the adoption of any crude, ill-digested, and haphazard measure which, without eliminating the cause of this epidemic, or in the least degree mitigating its virulence, only served to constitute as an additional source of calamity to the people. It was not long since that, in the name of sanitation, and in the cause of this epidemic, a fierce crusade was waged against the vegetable kingdom, with what wisdom he would quote a most able and conscientious officer of Government (he meant Mr. Dampier) to show. In his letter to Government dated 4th January 1864, paragraph 24, he says :

"It has been said, that as their own neglect of sanitary precautions is the cause of the sickness under which they suffer, the villages have no claim to assistance from without; but I do not believe that the inhabitants of the tracts which have suffered have been greater delinquents in this respect than those of other parts of Bengal, or of this division, who have hitherto escaped. I have seen jungle as thick, and habitations as unclean, in the suburbs behind Alipore, as I have met with in the worst of the fever-stricken villages which I have visited; and it is by no means clearly established that the neglect of precautions which were within the means of the villages, is the primary cause of the epidemic, although doubtless that neglect has intensified the visitation."

"But while he (Babu Degumber Mitter) deprecated in the strongest terms the drainage of bheels and rice-lands, with a view to the removal of the epidemic, he was fully sensible of the absolute necessity of drainage, so far as the villages were concerned. In fact, he had always held, and still held, that fever, wherever and whenever it had epidemically broken out in this country, was wholly and solely traceable to impeded village drainage, caused, in many instances, by railway feeders, which of late had sprung up in large numbers, wherever the same have crossed the drainage course of a village or villages. The same might be said of railways and other kinds of obstructions, whether they were offered in the passage of the rain water from a village to the adjoining paddy-fields, or from the paddy-fields into the bheels or from the bheel into a navigable stream.

"He had no hesitation in saying that many villages in Lower Bengal, especially in the district of Hooghly and Burdwan, were at this moment, and since some years, suffering from defective drainage, caused in some one or other of the various ways indicated in the passages he had quoted; and wherever the same had occurred, it had been invariably followed by the breaking out of this epidemic fever, the intensity of the attack being regulated by the complete or partial nature of the impediment offered to the drainage. But the proposed measure, while it provided for the drainage of the bheels and paddy-fields, made no provision for the removal of the obstructions to the free drainage of the villages."

After this complete exposure of the hollowness of the scheme, which aimed at combining sanitation or rather eradication of the epidemic fever and agricultural improvement by means of subsoil drainage of jullas and rice-fields, it is hardly necessary that we should say anything further on the subject. We may, however, remark that the very amusing idea of the sub-soil drainage of the jullas, beels and rice-fields of Bengal could not have taken possession of the mind of its originator or its supporters, if they had clearly realized the fact that Bengal had a drainage system of her own, and that that system, unless materially interfered with by nature or man, was quite sufficient, with occasional human co-operation to keep her villages dry and her arable lands in a fit state for the cultivation of suitable crops. We are, however, glad that this, to us outlandish scheme was abandoned as a general measure for the drainage of the districts of Bengal, and legislation was confined simply to the swamps west of Serampore, with what practical result either in the way of sanitary or agricultural improvements, time will show.

We would here take leave to observe that the drainage of this swamp is undertaken under legislative sanction even in the face of the stricken and admitted fact that the khals through which it relieved itself into the Hooghly, are yet open during the rains. In moving for leave "to bring in a Bill to facilitate the drainage and irrigation of districts in Bengal" Mr. Eden said, "from the first of these reports it appeared that the khals, or natural drainage channels, which once led from these swamps to the Hooghly, and were formerly navigable for small crafts throughout the year, had so silted up as to be only capable of carrying off marginal overflow during the monsoon." Now, from the above it is quite evident that unlike what the *Friend* would make it appear, the khals, leading from this swamp, like many other khals, though they had silted up, are yet quite capable of carrying the overflow of the swamp to its natural outfall, the Hooghly, during the rains, thus performing their intended function, for there is no surface drainage to carry during the dry months. The drainage of the villages bordering upon this swamp is thus yet preserved intact, and its sanitary influence is evident from the statistics furnished by Mr. Adley himself. For while the mortality in the villages bordering upon this swamp is shown to be 6 per cent. of the population per annum, that in the epidemic villages, though much more favorably situated, was 75 per cent. during the prevalence of the epidemic embracing two or three years. So that as a measure of sanitation, the experimental reclamation of the swamp west of Serampore was not at all needed, and yet the whole machinary of Government was set and kept in motion for upwards of three years to devise this strange and worthless scheme for eradication of the epidemic fever.

We will now conclude our remarks on this melancholy subject by calling the attention of the authorities to a few salient points in our remarks, strikingly corroborative of the theory which we have been advocating in these columns for the last eight years.

In our issue of the 5th August last we gave a detailed account, shewing how a Kutcha road, touching the Grand Trunk Road at Myapore and continued as far south as Khanakool, had caused the outbreak of the epidemic fever in a number of villages, the drainage khals of which, about ten in number, were closed by a section of that road, as any person visiting the locality could easily see and judge for himself. As a significant fact we also mentioned that the section of the road in question was constructed in 1276 Bengali era, corresponding with 1869 of the Christian era, and it followed by an outbreak of fever immediately on the succeeding year in all the villages lying on that section in a somewhat mitigated form, and in the year 1871 it assumed a virulent type. The fever, as a matter of course, had commenced to abate from February of 1872 *i. e.* with the setting in of the hot weather and there was no fever at the time we wrote the article in question. But knowing for certain that it would return with the close of the rains we earnestly exhorted the authorities to open out, without loss of time, the mouths of the ten khals which had been closed by the road in question. We also made the same request with regard to certain other khals, which had been closed by the zemindars, being similarly followed by the outbreak of the epidemic in all those villages of which they were the drainage channels. The authorities did not take any notice of our remonstrance, and we had the painful duty of announcing in our issue of the 19th of the same month that the apprehended return had already taken place, and of drawing attention, in our issues of the 16th September and 19th November last, to the fearful ravages it was committing. We are horrified to record now, that the havoc committed this season by the epidemic is such that in many a household there is scarcely a member left to remove the dead, and this in the face of the weekly reports on public health to the effect that fever is abating in the districts of Hooghly and Burdwan. Now, who is responsible for thus sporting with the lives of Her Majesty's subjects? It is strange, indeed passing strange, that the closure of a number of khals, the visible channels of drainage of the surrounding country, should not have attracted the attention of the local officers, and suggested to them the necessity of some enquiry on the subject. Even if they were not clear-sighted enough to perceive the connexion between the fever and the closure of the drainage channels, was not the fact of their closure having been immediately and simultaneously followed by the outbreak of the epidemic fever in nearly a hundred villages, of itself sufficient to rouse them from their apathy, and induce them even as an experiment, to open out those khals, especially when the same might have been done at a trifling cost of 50 to 60 rupees? May we venture to ask why were not the khals opened out at the time we called upon the authorities to do so, and which, if done, we feel as certain as we are alive, would have saved the lives of hundreds and thousands, who have fallen victims to this culpable indifference? The mischief for the season has been done, and nothing but the return of the hot weather in due course can prevent the further sacrifice of life. But on behalf of the surviving population we would yet entreat His Honor to open out those khals, and also to remove the other obstructions, which have been offered to the drainage of a number of villages in the Sub-Division of Jehanabad, enumerated in our issues of the 5th August and 16th September last, and which we feel confident may be effected at a cost of not more than 200 Rs. This done we can, we do not hesitate to say, guarantee the restoration of the villages to their former healthy condition.

We beg to be excused for writing so dogmatically upon a subject which has so sorely puzzled professional men for nearly the last twelve years, and we should not at all wonder if in our zeal to propagate our honest opinion we should render ourselves obnoxious to the charge of unseemly presumption. Our apology, however, for thus obtruding our convictions, formed after careful enquiries and laborious thought, is that we feel very strongly on the subject, and that we believe that the question is one which does not lie beyond the domain of common sense. On the contrary, our own humble opinion is that it is more likely to be correctly solved by a careful and intelligent analysis of facts diligently and discriminatingly collected in the epidemic villages, than by the mere application to the symptoms and course of the fever of laws propounded in medical books, many of which laws are yet far from attaining the certainty of scientific truths. We need not say that being natives of the country our opportunities for the collection and digestion of facts likely to lead to a correct solution of the question at issue, are much greater than those possessed by a foreigner to the country, however qualified he may otherwise be for the conduct of such enquiry. Indeed, our conviction of the proximate cause of the epidemic fever being the obstructions offered to the surface drainage of a village during the monsoon, is so strong that we are sometimes lost in wonder, that a thing so plain and palpable should elude the grasp of any man, much more that of the able men engaged for years in catching it—and the only solution which we can offer for what appears to be a strange phenomenon is the simplicity of the cause assigned. People wonder and many to our knowledge have expressed their disbelief that such a dreadful catastrophe could possibly spring from such a simple cause. We do not, however, despair of the ultimate triumph of truth though we extremely regret, that like the fact of the capers and not anchovies growing in the garden of the Governor of Malta not dawning on the Irishman, who fought for the decision of that question, before he had killed his adversary in a duel, the cause of the epidemic fever should similarly not dawn on the minds of our rulers until many more lives are lost.

VI.

We have to acknowledge with thanks the receipt of Lieutenant Colonel F. T. Haig's "Notes on the drainage and water-supply of the Hooghly District," and to express our apology for not noticing it earlier. The gallant Colonel demolishes, one after another, with great eclat, and, in some instances with considerable success the different theories that have been broached on the subject. Adverting to Jullahs or Marshes Col. Haig says:

"With regard to causation, no connexion has yet been traced between the intensity of the fever and proximity to stagnant marshes, although we should certainly conclude that this would be the case if these were the only generating sources of the disease. On the contrary, there are numerous facts which are absolutely irreconcilable with such a supposition. Some of the villages on the borders of the Dancuni Jullahs have been distinguished by comparative immunity from the fever, while it has raged in others which are quite free from swamps. The Collector reports that Chanditola and the neighbouring villages on the south-west corner of these swamps have generally been considered "exceptionally healthy." Moreover, I believe, I am correct in saying that the southern parts of the District, in which the drainage is in a far worse condition than in the northern, have on the whole suffered less. I have myself seen villages situated on high ground from which the levels sloped away gradually in all directions for a mile or two, and within which there was not, in the month of January, and plainly could not be at any other time of the year, a vestige of a swamp; yet these had all had the fever; all had a dismal tale of suffering to tell. It is vain, therefore, in my opinion, to look for the origin of the fever solely in the swamps, great or small, scattered over the country, and which occupy an insignificant fraction of its surface."

This is precisely what the Hon'ble Degumber Mitter said from his place in the Bengal Council when the Dancuni Reclamation Bill was first read in Council. After dwelling on other arguments proving the absence of all connexion between the epidemic fever and the marshes of this country, the Hon'ble Member thus expressed himself.

"But even as regards the villages surrounding the Dancuni bheel or jullah, the drainage of which was considered so imperative in the cause of the epidemic that an estimate had been already made, and the drainage operations of which would perhaps be commenced upon immediately on the proposed measure becoming law, did we find anything like an epidemic there? In appendix B. subjoined to Mr. Adley's report, it was stated that in 26 villages surrounding that *bheel* the mortality in three years was only 2,145 amongst a population of 10,949 souls, or about 6½ per cent., per annum; whereas, in an epidemic village, one-third, and even half the population was carried off in one year. But the idea that the *bheels*, which had existed since the formation of the country itself, and the rice lands, which we meet on the surface of the whole country, were the generating causes of the epidemic, and that they must be drained if the epidemic was to be checked, was so preposterous, that he would not detain the Council with further remarks on that head."

Any yet with the object of promoting sanitation, and on the strength of the report of Mr. Adley, the reclamation of these Jullas, which are to be met with in numbers in every part of the country, was considered to be so imperative that a general measure was for that purpose introduced into the Bengal Council, and most resolutely pressed forward. That it was subsequently curtailed in its scope, and limited in its operation, by being made only a tentative measure for the reclamation of the Dancuni Jullah, was solely due to the strong opposition offered by the Hon'ble gentleman. It must, therefore, be a matter of great satisfaction to him that, as regards the primary object of the reclamation project *viz.*, the eradication of the epidemic fever, his opinion is supported by no less an authority than that of Col. Haig. We fear that the other object aimed at in that scheme, *viz.*, the reclamation of the marsh as a remunerative undertaking, is equally uncertain. Already the percentage of profits upon outlay estimated by Mr. Adley, has been cut down by Col. Haig from something like 20 percent. to 11 percent., and time will show whether the actual will not be considerably below the revised estimate.

Col. Haig disposes of the bad-water theory of the epidemic fever, in an equally curt manner. He says, "I recently visited the whole of the villages on the banks of the Damoodah for a distance of 30 miles, and was everywhere assured by the people that they drank the river water, which is excellent; yet there is probably no part of the District in which the epidemic has been more prevalent or more deadly."

With regard to the excessive humidity of the sub-soil caused by various obstructions offered to the surface drainage of the villages, being the exciting cause of the epidemic fever, which was advanced for the first time by the Hon'ble Degumber Mitter when a member of the Epidemic Commission, and which has ever since been strenuously supported in the columns of this paper, Col. Haig observes as follows:

"It will be gathered from the foregoing remarks that I do not look upon drainage *per se* as a complete cure, or even as the principal means of cure, for the fever which has so desolated the Hooghly and Burdwan Districts. All that it can do will be to remove one source of malaria in the swamps, and, to a certain extent, to diminish the excessive humidity of the soil, which last is perhaps the most important exciting cause of the disease. All experience, and the distinctly malarious type of the fever itself, notably the almost invariable presence of splenic complications, tend to the belief that, despite certain facts, which it is difficult to reconcile with the theory, the fever owes its origin in some way or other, directly or indirectly, to the above or to similar causes. But in a rice-growing country drainage cannot wholly eradicate these. It can probably do nothing more than modify the most important of them, and that only in a moderate degree, and it cannot in any way touch those other causes which are wholly distinct, and to which I think, must be attributed the great mortality which has attended the present epidemic. Unless some great and fundamental change take place in the present conditions of agriculture and population, the element of epidemic disease will, I believe, remain, though it may be with diminished force, in spite of drainage, and, in the absence of other remedial measures, may again lead to similar outbreaks, and even reproduce a similar mortality."

The foregoing shows that, while from the symptoms accompanying the fever, and the sequelæ with which it is invariably followed, the Colonel cannot help attaching much importance to the theory which assigns its origin to something in the soil, still he cannot get over the difficulty of believing it as *the* exciting cause of the epidemic, that cause being ever present in the rice-fields of the country. The difficulty experienced by Col. Haig is, however, one, which, we are well aware, is more or less felt by every foreigner in investigating the subject, and it was with a view to assist people in the mastering of that difficulty, if possible, that we have issued a series of articles on this question. We will, however, once more recur to it.

There is no doubt that the periodical heavy rains must cause considerable humidity in the sub-soil of the country, consisting as it does, wholly or chiefly, of low-lying paddy lands, but it is a very strange fact, the why and wherefore of which we need not here stop to consider, that the effect of this humidity on the human system is not felt so much during the continuance of the rains as on its close, when fever of the malarious type breaks out more or less in every part of the country, and if not soon checked by proper treatment, assumes an intermittent type, and hangs on till the hot weather sets in, when the patient is cured by the mere change in the weather, with little or no aid from medicine. What we contend for is that the fever, which is committing such fearful devastations in some parts of Hooghly and Burdwan, as it had often done before in other parts of Bengal, is nothing more than the same fever which rages endemically throughout the country from the middle of September to the close of November. The question therefore arises,—what is it that has in certain places converted this fever from the endemic to the epidemic form ? We submit that the same cause, which in its normal condition was only sufficient to generate the fever in a mild and endemic type would, when intensified, help to develop it into an epidemic, and that cause, we contend, has been intensified by the surface drainage of such of the villages where the epidemic has broken out, having been obstructed in the various ways we have lately described. We cannot, however, conclude our review of this part of the paper without bearing our testimony to the complete innocence of the rice-fields of all participation in the crime of causing the epidemic, and entreating Col. Haig in behalf of the millions of this country, not to molest them, as they are the main, if not the only, source of the food supply of the people.

Turning from the destructive to the constructive, the gallant Colonel thus delivers himself of what in his opinion appears to be the cause of the epidemic fever.

"I conceive, then, that no explanation of the present epidemic is to be found in the supposition of an increased activity, or wider prevalence, of the causes or agencies which are supposed to produce malarial disease. The sources [of the disease I believe to have been precisely the same as have always been in existence in these Districts. The excessive mortality must be due to the failing stamina of the population generally, to a degeneration and loss of vital energy, which render them less capable of resisting the morbific influences to which they have always been exposed. And I conceive that this is due chiefly to the increase of population having outstripped the means of production, to an impoverished and under-fed condition of the great mass of the people; n fact, that we now witness the last sad stage of that process (hastened in this instance by unhealthy conditions of climate, and perhaps also by excessive rents) by which over-population, in the absence of any special counteracting or remedial measures, works its own cure."

If there be any truth in the idea of deficient nourishment and epidemic fever being related to each other as cause and effect, how was it, we may respectfully ask, that the fever did not make itself manifest when its alleged cause was in operation with greatest force and intensity in the Orissa districts during the famine year of 1865-66? The whole province of Orissa is essentially a rice-growing country, more so than either Hooghly or Burdwan; and the famine broke out at a time of the year when miasm was most abundantly propagated, *viz.* during the close of the rains and yet amongst a million of deaths, which must have occurred within the short period of a year, not a single case was known to be preceded by or accompanied with any of the symptoms, which are invariably attendant on the epidemic fever, wherever and whenever it breaks out in this country. But even in the case of Hooghly or Burdwan, does not the unanimous testimony of all medical men show that the epidemic is quite impartial in the selection of its victims, and that wherever it breaks out it spares neither the rich nor the poor? Is it not a notorious fact, again, that in both those districts, out of 50 villages within a given area 40 are attacked, and 10 have entirely escaped? If so, is it to be supposed that the people living in the favoured ten, are the only well-fed out of all those who occupy the fifty villages within the given area? Is the town of Jessore, where the same fever raged endemically for a number of years, the only place in the district where the people were ill-fed? and was Cossimbazar, at one time the emporium of Bengal, depopulated during the height of its glory by the same epidemic fever because of want of sufficient nourishment? As a project for reclaiming a few thousand acres of land from swamp, and rendering them fit for the cultivation with paddy, we have grave doubts whether Colonel Haig's scheme will prove more effective or sounder than as a measure of sanitation. If during the monsoons the beds of the swamps are higher than the water-level of the stream into which it is intended that they should empty themselves, no doubt they will gradually silt up by washings from the adjacent country. But it will be a work of time, and the time it will take to make the work reproductive will of itself considerably reduce the estimated dividend (9½ per cent.) on the outlay, even if that estimate should eventually turn out to be correct, and if the projected works ever become accomplished facts. Our lay opinion, we know, will weigh as a feather against that of a professional engineer. Nevertheless we cannot refrain from observing that it is our strong conviction that the filling-up of these marshes, which are in the first instance the natural receptacles of the drainage of the country before it finds way into a navigable stream, will necessitate a complicated and most expensive system of artificial drainage (something like that of Calcutta,) which the country will be utterly unable to pay for, and which, unless carried out simultaneously with the drainage of the marshes, will be productive of the same disastrous consequences to the whole district, which are now confined, to a very small area of it.

We are afraid Col. Haig has not also made a correct use of his statistics in drawing his conclusions about the insufficient food-supply of the district. Col. Haig, to be on the safe side, modestly assumes for his calculation the population at 940 per square mile instead 1045, as obtained from the last Census returns, but taking the population even at the higher figure and admitting, for the sake of argument, that the staple food-crop of the country, *viz.* paddy raised from a square mile of the country, is insufficient to sustain the population thereof, we would take the liberty to remind him that, unlike most other districts, a large area of Hooghly is under the cultivation of sugarcane, potato and other valuable crops—the net return from a biga of which is six times that of paddy; and it would be as reasonable to infer from this condition of things, that the population of the Hooghly District suffers from insufficiency of food, as it would be to assume that the people of certain Departments of France and of certain counties of England likewise did so, because the wheat crop there has been supplanted by hops and vines. If the primary object of Col. Haig be to augment the food-supply of the country, he would have a much surer basis to work upon, and his efforts would be more likely to be crowned with success, if, instead of wasting his energies on the marshes of Hooghly, he would direct his attention to the reclamation of the unappropriated lots of the Soonderbuns. With a fourth of the proposed outlay, we can assure him, he will supply the country with treble the quantity of paddy he estimates from the marshes of Hooghly.

VII.

In the Resolution which His Honor the Lieutenant Governor has recorded on the epidemic fever in the district of Beerbhoom, and which was published in the *Calcutta Gazette* of the 26th ultimo, occur the following remarks:

"The disease has been most severe in the south-east of the district, towards the river Adjai, and seems to be now making its way to the north and north-east of the district. The country is reported to be generally dry, with no excess of stagnant water as in Burdwan, while the fever has been equally virulent on alluvial, clay, sand or laterite. It would appear from this that neither the character of the soil nor humidity have any special relation to the existence and progress of the disease, and this makes the causes of this fever more mysterious than ever."

With due deference we beg to observe that His Honor has laid down his premises on very inaccurate information; and his inference that the humidity of the subsoil has no "special relation to the existence and progress of the disease" is necessarily incorrect. In the first place we should remark that so far as the theory we have been advocating for the last ten years is concerned, the only difference which the character of the soil makes is, that the facilities to drainage in every instance being the same, a village situated on a sandy or alluvial soil absorbs the monsoon water much more readily than one on a clavey soil. Hence it is that ordinarily the latter enjoys better health and is more free from the endemic malarious fever of the country, which breaks out annually at the close of the rains, than the former. But clay is not impervious to moisture, and when obstruction is offered to the surface drainage of a village built on clay, the monsoon water, not finding an easy vent, necessarily settles down into the subsoil, and though the process may not be so rapid as in the other case, the consequences are much more disastrous inasmuch as clay being very retentive of moisture, the process of drying by evaporation during the hot season would be as tardy as that of absorption had been, and hence the fever, when it breaks out in such places may not abate, as it does of itself every year during the hot season, so early as in sandy villages.

The Lieutenant Governor remarks that "the country is reported to be generally dry with no excess water as in Burdwan." As for stagnant water, we have all along maintained that whatever it may have to answer for, it is quite innocent of causing malarious fever, and Colonel Haig's paper, which contains some valuable information on the subject, has most satisfactorily established that fact. As regards the country being generally high and dry, there is no question about it, but we hope His Honor does not wish us to infer from this that a place ordinarily dry may not be rendered very damp, even when largely mixed with laterite (there is no village in Beerbhoom that we are aware of, which is purely laterite) or is impervious to damp, and if His Honor would direct the Magistrate of the district to make a special enquiry and report on the subject, that officer, we dare say, will testify as strongly and unhesitatingly, as Mr. Metcalfe has done, to the fact of all the places, where the epidemic has broken out, being excessively damp. The Magistrate will also have no difficulty, if he knows how to set about the enquiry, to discover what it is that has rendered so excessively damp places which were before noted for their dryness. To help him in his enquiry we take leave to state the following facts, which we have ascertained by deputing a competent person to hold a local investigation on the subject.

The river Adjai, which we believe is now the southern boundary of the district of Beerbhoom, in its progress eastwards to meet the Bhagiruthi at Cutwa, bifurcates at a place called Burro Simlia. The old Channel, which, taking a northerly course at the above-named place and making a bend at Doorgapore, resumes its easterly course and joins the other stream at Jehanabad, has been silting up since some years, and hence this portion of the river viz., from Burro Simlia to Jehanabad goes by the name of Kana Adjai. Since 1275-76 or 1868-69 this channel has completely silted up: until then it was the drainage outfall of a large tract of country lying to the north and north-west of it, as also of the narrow slip of land lying to its south, and extending from Burro Simlia to Lao Daha, about 12 to 14 miles in length. The following are names of the villages situated immediately on either bank of the Kana or silted-up portion of the Adjai : Dhannosurra, Doorgapore, *Operkhurra, Maddhokhhurra, Nobokhurra, Ikhoodhara*, Burdihi, Baijra, Jehanabad, Laodaha, Muchtolla, Jusra, Mohadebpore, Ghogolundee, *Atunda*, Sooltanpore, Chota Simlia and Burro Simlia. Obeying the law so often enunciated in these columns the surface drainage of all these places, first taking a direction opposite to that of the river, eventually returned to it by small or large khals, called Kandara কাঁদারা in that district. But as already observed, this section of the river has completely silted up since 1868-69, and there being no longer a receptacle for the drainage of all the places situated on its banks as well as those lying further north and northwest of it, the epidemic, as a matter of course, made its appearance in a mild form in all the aforementioned places in 1869-70, and has raged virulently during the last three seasons, so much so that nearly three-fourths of the entire population of all those localities have already died out. As for dampness the people of the district in one voice complain of it, and any man can perceive the same from the process of disentegration which the mudwalls in those villages are undergoing. Not knowing that dampness would cause the walls to crumble away in the manner these are now doing, they like those of Burdwan and Hooghly have given it the name of *Lona Dhura*. The silting up of the channel referred to has interfered with the drainage of many other places lying to the north and north-west of it, where the fever has also broken out, though not so virulently as in the villages situated on its banks.

We will now give an instance of a village which has as much of the laterite in its composition as any village in the district. The village of Sigwan is situated on the slope of a small hill about 3 miles due north of the Kana branch of the Adjai. Its drainage was effected by the monsoon water first running into five large shairs or tanks lying to the north-east, south, and east of the village, the said tanks sending their overflow into the adjoining paddy fields, as also by its following directly into the paddy fields through a pass or defile about 130 feet in width. This pass was embanked in the year 1869-70 at the point where it opened into paddy fields between two small tanks, lying on its southern and northern borders for the purpose of preventing the paddy lands being rendered unproductive by the deposit of sand, which used to be brought down through the pass with the drainage flow from the village and the adjacent hills. Thus one of the two channels of drainage, and perhaps the principal one, was closed, the tanks again, which when full used to send their overflow into the paddy fields, were strongly embanked in the same year by the zemindars of the place on the side facing the arable lands, so that the tanks might receive the drainage from the village, without sending the overflow into the arable lands. This was done with a view to keep the tanks full so that the water might be utilized during the dry seasons in irrigating the sugar-cane lands, to the cultivation of which the villagers had taken heartily of late years. Thus both media of drainage hitherto open to the village having been entirely closed in 1869-70, the fever broke out in the following year and has been virulently raging ever since.

The above-mentioned villages with the exception of Singwan are easily accessible by rail, being within a mile of the point where it crosses the Adjai, and we would beseech His Honor the Lieutenant Governor to visit those places on his way to Darjeeling and see with his own eyes whether the mudwalls of the houses in all the villages we have mentioned above, especially those we have italicized, where the fever has committed the greatest havoc, do not present incontestible evidence of dampness, and whether such dampness is not owing to impeded drainage caused by the silting-up of the channel in question. We are anxious the more for His Honor's personal inspection of those places as it may serve to show upon what hasty and careless enquiry opinions have been hitherto formed on this important subject. As regards our theory that impeded village surface drainage and the epidemic fever stand in relation to each other as cause and effect, we are perfectly satisfied from the local enquiries we have instituted on the subject that His Honor is quite mistaken in supposing, upon the ill-digested opinion of the local officers, that it is inapplicable to Beerbhoom villages. If it has been reported to him that there is any village in Beerbhoom situate entirely upon laterite, we have no hesitation in saying that it is incorrect. It is only true so far that there is a great admixture of small sandstone in the clay soil of many villages, but it is quite pervious to damp, if an obstruction is offered to the surface drainage of those villages. We have already described how the epidemic, which has broken out in a number of villages, is directly traceable to impeded drainage, and we are quite prepared to show how the like cause is in operation in other villages of Beerbhoom where the fever has occurred. But *cui bono* ?—though thousands and thousands are carried away every year by the fell scourge, the Government seems to be as apathetic as ever.

We have already in our previous articles on the subject, now reprinted in pamphlet form, given hundreds of instances in which the epidemic has followed impeded drainage as invariably as any effect would its true cause, and we had every reason to expect that its sufficiency to account for similar outbreaks in equally affected villages of Bengal would not be impeached or doubted unless the facts, on which our theory was based were proved to be incorrect. But we have been disappointed. We are, however, still prepared to clear away any doubts which may be yet entertained on the subject, and to that end would entreat the Government to mention any two or three villages either in Beerbhoom or in any other epidemic district, in which our theory may appear to be inapplicable, and we promise to stand or fall upon the determination of that issue.

VIII.

We thank the *Indian Medical Gazette* heartily for so kindly noticing the pamphlet on the Epidemic Fever in Bengal issued from this press. We regret we cannot reprint it bodily for want of space, but we will give a good portion of it. Our contemporary says :

" This little work is a reprint of five articles which appeared recently in the *Hindoo Patriot*. These articles were written, the preface tells us, " with a view to defend the position assumed by the Hon'ble Degumber Mitter in his minute on the subject, which was published as an appendix to the report of the epidemic Commission of 1861 ?" This position was, that the so-called epidemic fever is due to an obstruction of the surface drainage of villages, caused mainly by the construction of roads, railways and embankments, without a sufficient waterway for the ready discharge of rain and flood. The articles have evidently been written by a native of Bengal familiar with the conditions under which the people of the fever-infected tracts live, and, without any pretence of scientific knowledge; they abound in shrewd observation and apt illustration. The writer believes that the "question of fever causation is one which does not lie beyond the domain of common sense;" and, as a native of the country, he asserts that his "opportunities for the collection and digestion of facts likely to lead to a correct solution of the question at issue, are much greater than those possessed by a foreigner to the country, however qualified he may otherwise be for the conduct of such an inquiry" (page 61.) The system of natural drainage of Lower Bengal is described with accuracy. "The drainage of all the village in the epidemic districts, as elsewhere in Lower Bengal, is effected by the water first running into the nearest paddy-field lying in the direction of their slope; thence it collects in the *bheels,* from which it rushes through *khals* into large streams, which again communicate with navigable rivers. An obstruction occurring in any of these conduits must interfere with the drainage, and its effects are felt more or less according to the proximity or remoteness of the obstruction from the scene of its influence" (page 6). Villages are thus shown to be situated on the highest levels which can be found, and their surface drainage finds its way to the nearest paddy fields and *bheels.* Two important circumstances are pointed out;—1st, that as an invariable rule, the drainage slope of river banks is *away from the rivers*; and 2*nd*, that in order to judge rightly of the channels and directions in which the surface drainage of villages is effected it is necessary to study them during the rains when the water is actually being drained off them in bulk. An inquiry during the dry months, after the water has drained off, is sure to lead to imperfect results. Superficial observation may suggest that villages lying on the river-side of a road, railway, or other embankment, cannot possibly suffer from an obstruction of drainage caused by an impediment to landward of them; but the fact above-mentioned, which may be accepted as well established and invariable, proves the absurdity of such a position, which has actually been maintained byengineers and others, more than once. Numerous illustrations are given in detail in proof of the writer's contention. They are related very circumstantially, and carry strong presumption in favor of the accuracy of the views maintained, if not positive demonstration. Instances, are given of roads and embankments being recklessly constructed across a line of country, so that the surface drainage of a series of villages has been interrupted. A virulent outbreak of fever is said to have followed, while another series of villages lying beyond the influence of the road or embankment, and precisely similarly circumstanced in every other respect, has escaped. The best illustrations of this sort are those referring to sundry places in the Jehanabad sub-division of the Burdwan district. Evidence is adduced that the epidemics which depopulated the famous city of Gour, the English settlement of Cossim Bazar, the Dutch settlement of Kalkapore, and the French settlement of Furrasdanga, were caused by the construction of roads and embankments across the line of surface drainage. Instances are also given where the removal of the obstruction, either by the natural agency of the obstructed water (page 42), or by art (page 35), has been followed by an improvement in the health of the villages whose drainage had been closed, and others of exempted localities in the midst of fever tracts whose drainage had not been implicated. Evidence of this sort is very valuable. The writer goes so far as to say, that no place, whose drainage has been thus obstructed, has ever escaped a visitation of fever : and he even prophesied an outbreak with confidence which he alleges, occurred according to his prediction (page 58). It appears to be a matter of common observation that the places affected with this "epidemic" have become *damper*. The people assert it ; other observers (Mr. Metcalfe and Dr. Gupta) have recorded the circumstance ; the walls and floors have become moist, and the people have been compelled to lie on *charpoys* (bedsteads) ; plants growing in a dry soil have died out, and others thriving on a moist soil, have flourished (page 14); and records which use to be kept in holes in the mud walls of houses without harm, have now to be suspended from the roof. So far we followed the writer of this pamphlet who supports his particular view with much ability and force. He asserts that the fever is but the usual malarious fever of the autumn months, accompanied with splenic complications, and caused by the telluric poison arising when the soil is in process of drying. He shows that mere humidity, or the presence of water moisture, is not enough to cause this fever. People remain healthy during the rains when the land is under water and the atmosphere saturated with moisture, and villages situated close to *jheels*, perennially under water, are healthier than others *apparently* drier. It is a moist and drying soil that occasions this fever. In all this we entirely concur, and we subscribe a general adherence to the theory which this pamphlet expounds; but we think that the writer has underrated the effect of natural changes in rivers and levels occasioned by spontaneous deltaic alterations. The obliteration of such a river as the Kanna Nuddee cannot occur without most important effects on, the drainage of villages and fields. The writer asserts that, if river changes were the cause, then a general outbreak throughout all the villages under the drainage influence of the river would follow. We admit the force of this observation, but still contend that as different villages, differently circumstanced and conditioned, must have a more or less perfect system of natural drainage, so they must be more or less affected by a general obstruction. We would simply place obstructed and obliterated rivers as a cause of impaired drainge. We cannot follow the author of this pamphlet into all the subjects he has broached. He treats the jungle-cutting and tank-clearing and the sub-soil-drainning cures with scorn. As long as the physical Geography and rice cultivation of Bengal remain what they are, so long must there be, at certain periods of the year, water-logging and subsequent drying. The great object seems to be to remove the water from villages as soon as possible, and from rice fields when it is no longer wanted, and to prevent stagnation *to minimise the fever period.* He even doubts the advantage or profit of draining *jheels.* The "travelling theory" is also handled roughly."

The writer thus concludes :

" We have read this pamphlet with much interest. As a sensible exposition of the drainage theory, and an able statement of the causation of the "epidemic fevers of Bengal" from the point of view of the inhabitants of the country it is most valuable, and no one should presume to write on the subject without having carefully studied it."

We need hardly make an apology for giving a prominent place to the above extract, for it gives a powerful support to our theory, the importance of which cannot be exaggerated. Hitherto it had been derided by the medical profession with a *hauteur*, which was scarcely honorable to itself. But the freedom from prejudice and candour with which the *Medical Gazette* has handled the subject command our highest respect. May we ask whether the Government is now prepared to make the necessary enquiries and rectify the drainage channels, which, as shewn by us, have been obstructed by one cause or other? In our issue of the 15th August last we importuned the authorities to open out the 10 or 12 Khals which had been closed by the Mayapore road, which would not have cost more than a couple of hundreds of rupees, but it was not done, and we had the painful duty of announcing in our paper of the 16th September and 19th November following that the fever, which had only been kept in check by the setting in of the hot weather, had reappeared, and in our paper of the 13th January we described the fearful havocs it had committed. If the Government does not still move, the responsibility for the destruction of the lives of hundreds and thousands of Her Majesty's lieges and God's innocent creatures will rest upon its head. It is, however, a thousand pities that like the fact of the capers and not anchovies growing in the garden of the Governor of Malta not dawning on the Irishman who faught for the decision of that question, before he had killed his adversary in a dual, the cause of the epidemic fever should similarly not dawn on the minds of our rulers until many more lives are lost.

IX.

The last *Calcutta Gazette* contains another batch of official papers on the Epidemic Fever. In the Burdwan Fever Report for May last, we observe that while Dr. Dutt supports the theory we have been advocating in these columns, by instancing several villages, where obstruction offered to the drainage thereof has been followed by an outbreak of the epidemic fever, Dr. Roy attempts to refute certain facts mentioned in an article in this paper concerning the outbreak of the epidemic in the Sub-Division of Jehanabad, and since reprinted in a pamphlet issued from this press. Dr. Roy's statements on this point are thus summarized in the Magistrate's letter published in the *Gazette:* " Thus the pamphlet states that Garbari Khal which drains Jehanabad and other villages, was bunded up and obstructed by the zemindar in 1866-67, and that this lock-up was in the following year the cause of epidemic fever in all the villages which this Khal drained. Dr. Roy, after investigation on the spot, found that no obstruction existed for five years previous to the outbreak of the epidemic, and at the time it did make its appearance the obstruction *was no longer in existence,* and the Khal was quite patent and has remained so up to the present day." It is impossible to collect from the above what is the precise nature of the objection taken by Dr. Roy to the facts mentioned by us. The questions at issue, on the particular point of enquiry, are: 1st was the Gurbari Khal the drainage channel of certain villages in the Sub-Division of Jehanabad and of Jehanabad itself? 2nd, was it dammed up at its mouth in the year 1866-67 as stated in the pamphlet? 3rd, was not that act followed within two years by an outbreak of the fever in all the villages mentioned in the pamphlet and many others not named therein, of which the Khal in question was the drainage channel? Judging from the summary given above, it is difficult to understand what the Doctor means by affirming " that no obstruction existed for 5 years previous to the outbreak of the epidemic, and at the time it did make it appearance, the obstruction *was no longer in existence.*" If no obstruction had been offered to the drainage of a certain tract of country by the khal in question before the outbreak of the epidemic, with what propriety or consistency can it be said that the obstruction " *was no longer in existence*" at its appearance? We very much suspect that what the Doctor has really said in his report on the subject has not been correctly summarized by the Magistrate. If however, the Doctor really denies the construction of the dam in question in 1866-67, and that of the outbreak of the epidemic in the particular tract of country of which the khal was the drainage outlet, within two years of the construction of the same, he asserts what we cannot help saying is contrary to fact. We repeat again without any fear of contradiction, that the khal was dammed up in 1866-67, that the fever broke out in a mitigated form the year after, and in a virulent form from the second year of its closure, and to the best of our information the bund is still in existence. We take this opportunity, however to notice that the drainage of the tract in question, no longer finding egress through its natural channel the Gurbari Khal, on account of the substantial dam thrown across at its mouth, has either aided, or perhaps quite unaided, by man, found vent through another channel. We doubt very much whether the new channel, which the pent-up water in the Gurbari Khal has opened out for itself, is deep enough to drain sufficiently the Byra Julla, so as to enable the latter to draw the drainage of the surrounding villages. Our doubts on the point are strengthened by the fact of the dam across the Khal being still maintained by the zemindar. The dam, it ocan not be denied, was constructed for the purpose of preventing the monsoon water from the surface of the paddy lands finding an outlet through the Khal into the Kana Nuddee. Where then would be the necessity of maintaining the cross dam, if the new channel was sufficiently deep so to drain the rice lands and the Julla as to admit of their receiving in their turn the drainage of the neighbouring villages? We need not mention that in that case the paddy lands would dry as before, and thereby defeat the very object for which the Khal was bunded. If, however, the new channel was sufficiently deep for the drainage of the villages and not simply for carrying away the super-abundant water from the rice-field for the benefit only of the paddy crop—the drainage of the tract being thus restored, accidentally or otherwise, the villages, would as a matter of course, recover (see pamphlet *pp.* 34 to 36).

With regard to the bunding of the Kokoo Nuddee (stated by mistake Kana Nuddee in the summary) Dr. Roy is stated to have said "that the bunding was nothing new, but had been carried on for ages." This remark of the Doctor is so far true, that the zemindars owning the tract of country drained by the Gurbari Khal and the Kokoo Nuddee had, for the purpose of retaining water on their comparatively highly-situated paddy lands, repeatedly bunded the two khals, but he has forgotten to mention that the pressure of water had as repeatedly carried away the bunds. No permanent obstruction had consequently been offered to the drainage of the villages until 1866-67, when the Kokoo Nuddee was strongly bunded and an escape provided for the superfluous water not required for agricultural purposes. This device, while fully preserving the usefulness of the cross dam, has had the effect of sufficiently reducing the pressure of water upon it, and thereby guarding against its being breached or carried away, a mishap which the previous repeated attempts at bunding had resulted in. We cannot without seeing the report itself judge what sort of enquiry Dr. Roy instituted and what conclusions he has really come to, in regard to the two drainage channels under notice, but we are not quite sure that one who is totally unacquainted with the drainage system of our country, as the learned Doctor does not seem to be quite the person to conduct such enquiries with accuracy, even if he were not already wedded, as we perceive from the Magistrate's letter he is to a theory of his own *viz.*, ploughed up lands contributing to the propagation of the epidemic fever!

As regards Chandoor it was once remarked to us (by way of impugning the correctness of our theory) by one who was in the locality when the epidemic first broke out in Jehanabad and its neighbourhood, that if, as contended by us, the closure of the Gurbari Khal and Kokoo Nuddee had contributed to the propagation of the epidemic in those places, how was it that Chandoor, which was drained by the former, had escaped? Believing the fact of the escape of Chandoor to be true, as it might be true to the extent of its not having been infected simultaneously with the surrounding villages, we did not know how to account for what we considered an anomaly until questioning our informant further on the subject we learnt that the place was located on a particularly elevated situation, which we thought would sufficiently account for its exemption. It was not to be supposed that we should be acquanted with every petty village in the sub-division, which was more than could be expected even of a constant resident thereof, and relying upon the statement made by our informant, which we repeat might be true to the extent of the village in question not having been attacked simultaneously with the surrounding villages, but somewhat later and unknown to our informant, we made use of the fact, not as it has been erroneously held in some quarters in illustration of our theory, but in explanation of what we were led to believe as an exception not covered by it. If, however, the fact be that Chandoor was attacked a little later than the surrounding villages, or even simultaneously with them, it only corroborates our theory the more completely, proving that all the villages of which the Gurbari Khal was the drainage channel, suffered from the epidemic fever without a single exception. It would have been quite otherwise, and we would have given Dr. Roy the credit of having made some impression upon our theory, if he could have shown that the two drainage channels in question were not closed in 1866-67, or that the fever did not break out in the villages within two years of their closure, or that any 3 or 4 villages, (out of hundreds) of which the khals were unmistakeably the only drainage channels, were free from the epidemic fever. We are glad, however, that a most searching enquiry is being instituted to test the truth of the theory advocated by us, and it is a matter of congratulation to us that not one of the numerous and main facts adduced in support of it, has yet been successfully controverted; on the contrary, if any thing, such enquiries are bringing to light additional facts in corroboration of it. It is far from our wish to obtain a transient victory at the expense of truth. We have given to the public what, after a careful observation, collection and analysis of facts for years, we have honestly thought to be the right solution of this all-important and vexed question, and are quite prepared to await with patience their verdict upon it. We are, however, sorry at the fault-finding and hypocritical spirit in which the enquiry has been evidently taken up in certain quarters. For though we feel assured that such criticisms would be quite impotent to smother the truth, yet it might prolong to an indefinite period, the discussion of this life-and-death question and in the meantime many more thousands of lives might be carried off before any preventive measure was decided upon or carried out.

X.

We give below the population and mortality of seven epidemic-stricken villages out of many in the neighbourhood of Rughonathpore, Krishnugger, in the Sub-Division of Jehanabad. The epidemic in every instance broke out within a year or two of the obstruction offered to the drainage of the villages in question. In the case of Obidpore the drainage channel was closed by the zemindar owning that village by May of 1872. The epidemic made its appearance in October following, that is to say immediately after the close of the rains, and by February of 1873 viz., within the short period of five months, more than 30 per cent. of the population had been carried off. We have in our possession the details from which the subjoined abstract statement is prepared, containing the name of the head of each household and the number of persons composing each household, and the number of deaths in each. The statement may, therefore, be fully relied upon :

NAME OF THE VILLAGE.	POPULATION IN 1869-70.		DEATHS IN 1871-72 AND 1872-73.	
	Male.	Female.	Male.	Female.
Serampore............	455	422	212	194
Kolimba................	395	309	169	163
Alghurra..............	650	588	270	235
Obidpore..............	849	895	254	275
Rughonathpore........	159	173	45	49
Senpore...............	253	248	85	79
Gobindpore...........	418	309	140	115
	3174	2944	1173	1110

When such is the mortality in 7 villages out of hundreds attacked with the epidemic fever, we will ask the *Friend* to calculate how many hundred years it will take all the Ruths in Bengal put together to achieve, what the unchecked epidemic fever is doing every year. We would also earnestly request him and the Sub-Divisional officer of Serampore to examine and see if the drainage of Rishra and Mahesh has not been almost entirely shut out from its natural channels by the intervention of a kutcha road running along the Western boundary of both those villages and constructed within the last 5 years, followed by the outbreak of the epidemic fever simultaneously in both the places almost in the succeeding year. In making the enquiry, it should be borne in mind that both those places being situated on the Western bank of the Hooghly, their slope, as a matter of necessity, is towards the west—and the drainage must consequently run in that direction until it found its natural channels of outfall. The point of enquiry therefore is whether the road in question has or has not cut off the drainage of both those places from those natural channels. It should also be borne in mind that the country being flat, the drainage runs over its whole surface, a culvert or two in the road at long intervals will not remedy the defect, unless measures were adopted to lead the drainage into those culverts. We have of late taken some pains to examine the drainage of those places, and we shall be happy to be corrected if we are wrong in the conclusions we have been led to.

We would take this opportunity to notice a Resolution of His Honor the Lieutenant Governor on the subject, which has just been published. The text furnished for this Resolution is a report of Mr. Harrison the Magistrate of Midnapore, in which is incorporated that of the Civil Surgeon of the district. The greater portion of the report is devoted to an account of the geographical features of the district and to the curative measures which have been adopted as also those which are in contemplation. We need not wait to comment upon the latter, as the medical authorities of any note who have had practical experience of the treatment of this disease, have already in one voice, more than once, expressed their decided opinion of the utter impotency of any known treatment, to make the slightest impression upon the disease, whilst the patient was still exposed to those influences which might have contributed to its generation. As regards causation Mr. Harrison thus disposes of the travelling theory, which under the patronage of His Honor had hitherto held sway over some minds:

" It is only into a portion—but the most alluvial and the most densely populated portion—of this latter section that the fever has yet spread; and if Dr. Mathew's account of its progress is carefully examined it will, I think, appear that, though in many respects capricious in its action, it has not yet passed into any other tract, while it has deflected from its more natural line of progression from Hooghly and Jehanabad westwards, and chosen a southerly and south-westerly direction, preferring the alluvial soil, and more particularly the depressed valley in the centre of it."

As to impure water, jungle and other insanitary conditions of the villages, contributing to the propagation of the epidemic fever Dr. Mathew thus observes, and Mr. Harrison fully subscribes to his remarks:

"Scattered cases of fever had occurred in the surrounding villages, and I was inclined at the time to believe that their immunity from anything like an epidemic invasion was due to the fact of their having a better water-supply from the adjacent river than the people of Nowadah, who used for drinking purposes the water of the filthy village tanks." A subsequent paragraph will, however, tend to show how untenable the theory of the fever-producing power of impure water was in this particular instance.

"It will be observed that the villages of Bowaneepore, Herratollah, &c., are separated from Narajole town and bazar by a narrow stream. There was no very marked difference in the sanitary condition of those places. Perhaps, if anything, Narajole is less cumbered by jungle and the houses less crowded, yet the difference in the incidence of the disease is very marked.

"Utterly regardless of every law that conduces to health the villagers remain, year after year, surrounded by all those oft-described sources of nuisance with which we are only too familiar: and that the people not only live in such places, but increase and multiply into the bargain, is a pretty clear proof that stench *per se* will not cause disease, and that its deleterious effects on health bear no proportion to its offensiveness."

In spite of the decided opinion thus expressed and in direct contradiction to it, so far as the exciting cause of the fever is concerned, Dr. Mathew recommends the following as preventive measures:

"In a previous paragraph I alluded to the sanitary condition of the villages, and I have no doubt, were it practicable to free them from the jungle by which they are cumbered and improve the water-supply, considerable benefit would result.

"Dr. Elliot has pointed out forcibly and clearly what should be done in this direction, and it is greatly to be regretted that no means of effectually carrying out the measures he advocates appear to be available, and consequently the utility of further alluding to the subject here appears doubtful."

To the above Mr. Harrison is strongly opposed, and he thus records his protest:

"I ought not to omit to say, with reference to Dr. Mathew's paragraphs 105 and 106, that I earnestly protest against any attempt to clear away jungle or clean out tanks *compulsorily* in the affected villages. I saw a great deal of these measures when at Baraset, and afterwards at Krishnaghur, when those two places were both under the influence of the epidemic, and am convinced that they lead to a great deal of oppression, destruction of valuable property, expense, and no corresponding benefit. If done thoroughly they might lead to good results; but to do this it would be necessary to spend thousands of rupees in each village."

In the estimation of the Lieutenant Governor there is nothing in the report so worthy of his attention as the recommendation of Dr. Mathew, and regardless of the experience of the last ten years and of the sufferings it will entail, and forgetting that to put down vegetation in this country in the way some of the medical men recommend is as mischievous as it is fortunately utterly impossible, His Honor thus interposes with his fiat:

"Mr. Harrison objects to clearing jungle and tanks compulsorily in the affected villages. The Lieutenant Governor, however, desires that if the state of things is so bad as described by Dr. Mathew, something should be done to cleanse the villages, and the Magistrate should try what he can do by persuasion."

Colonel Haig's theory of insufficient nourishment as generating the epidemic fever is thus disposed of both by Dr. Mathew and Mr. Harrison:

"With regard to the circumstances of the people, I believe them to be moderately good. Since the year 1866 there has been no scarcity of food in the district, and there are no grounds for the belief that in the quarters of the zillah where fever prevailed the condition of the people in this respect has undergone change during the past three years.

"Agreeing as I do entirely with all that is here written, I have little to add to it. The description given by Dr. Mathew applies, as is well known, to all the alluvial tracts in Bengal where the drainage is chocked up and the population overgrown. But if the most populated, it is also the wealthiest part of the district; whether tested by its crops, its wealth, its schools, or its castes, it ranks first. It is here that the only jute grown in the district is found; sugar cane is grown in abundance. Nowadah is the great emporium of *goor* in the district; Ghatal, again, is the wealthiest town in the district next to Midnapore; all the traffic of the northern section passes through it. A toll at its entrance, on a very bad cucha road, lets for over Rs. 4,000 a year. Again, the patshalas that have come in under the new scheme in this neighbourhood outnumber those in the littoral tract as 3 to 1, and in the laterite as 10 to 1. Here too the Brahmins and Kaests of the district are to be found, and the "*bhodrolok*" are so numerous that I have heard it said, with reference to this fever, "it is better to die in Disspore, than to live in one of the jungle mehals."

As regards the condition of the drainage of the affected parts Dr. Mathew thus remarks:

"These bunds are characteristic features of this part of the country, forming in many places the only high roads, and are no doubt of immense importance. I now allude to what are known as the Government embankments which follow the courses of the principal rivers.

"In addition to these are another series of embankments known as the zemindary bunds, and with reference to the utility of these structures some doubts in many instances seem to exist.

"It would appear that in former years each landholder made such arrangements for protecting his land from inundation as seemed to him most suitable, and running in almost every direction. These bunds certainly act as potent obstructors of the natural drainage of the country, and it is the opinion of the engineer in charge of the irrigation works in this district that many of them might be removed with considerable advantage."

"The Government embankments no doubt control the floods; and their utility, as far as I know, has never been questioned; but there can be very little doubt that they also obstruct the drainage of the country, and that to a very serious extent.

"The sluicing arrangements are lamentably deficient, and only allow surface water to flow off. They are much too few in number, and are, moreover, faulty in construction; their floors are in many instances above the level of the country, so that their utility for drainage purposes may well be questioned.

"I am given to understand that estimates for repairing and constructing no less than 60 sluices on one embankment alone have been prepared; and with a system of bunds that stand in need of such all important alterations I think it may be assumed that the surface drainage of the country is obstructed and the subsoil water-logged."

To the above Mr. Harrison adds:

"To the above description I have little to add, and nothing to find fault with, unless it be the tenderness with which the Government embankments are treated. The river-beds having been raised by the constant deposit of silt, to abandon these embankments now would no doubt involve enormous tracts in total ruin; but it was this system of embanking which has deprived the country of its natural increment of deposit and kept it permanently depressed, while its drainage channel have gradually become irrigation channels, its waterways choked up, and the whole area water-logged."

Without tracing the drainage of each village to its natural outfall, it is impossible to say from the general remarks of Mr. Harrison and Mr. Mathew how far any recent public embankments and the zemindary bunds have contributed to interfere with the drainage of the affected tract—though we have not the slightest doubt, that it is the obstruction however offered to the drainage of the villages that has caused the mischief—and we would have no difficulty in tracing out the obstructions, nor would we spare ourselves the trouble of so doing; but *cui bono* ¿ We will, however, remark in passing, that if the epidemic fever as is testified to both by Mr. Harrison and Dr. Mathew has as yet shown a decided preference for villages situated on alluvial soil, it is not because they are so situated, but because the natural drainage of those villages has in some manner been interfered with. There must be many such alluvial villages in the district, and yet they are quite free from the epidemic fever, and, we venture to predict, they will remain so, as long as their natural drainage is not tampered with, though Mr. Harrison's littoral and laterite villages are sure to yield (though perhaps not so readily as the others) if their drainage is intercepted from its outfall. We would therefore exhort those able officers to examine carefully the drainage levels of the affected villages, and see if any obstruction has been offered to its flow into its natural outfall. In conducting this important, though apparently simple, enquiry, we would recommend these gentlemen to avail themselves of the services of the agriculturists of the afflicted villages, as these men, from the nature of their occupation, have a more intimate and correct knowledge of the drainage course of their own villages than any *Bhadralok.* We would ourselves have gladly undertaken the tax, but we repeat, *cui bono?* We have already in more than 50 instances shown how the drainage has been obstructed and how such obstruction has been followed within a year or two by the outbreak of the epidemic fever in all the villages lying within its influence; but the Government seems to be as apathetic as ever. On the contrary an attempt had been lately made to controvert or rather to weaken the importance we had attached to the closure of two khals in propagating the epidemic fever in Jehanabad and its neighbourhood; but how lame and impotent the attempt was, we have already shown in one of our late issues. Many of the instances we have cited are in respect of places which are within hail and easily approachable by rail. The two with which this article begins are within 10 miles of Belvedere and adjoin Serampore. Is it too much then if we ask His Honor, who is so fond of satisfying himself of things with his own eyes, when convenient to visit the spot and examine for himself the correctness or otherwise of the facts mentioned by us? If required we shall be happy to furnish maps of both the places showing their drainage course and how it has been intercepted by the intervention of the road in question.

XI.

It would appear from the official papers on the subject published in the last number of the *Calcutta Gazette* that in the month of March last the Lieutenant Governor had submitted to the Government of India what His Honor then considered a valuable note of Col. Haig on the Epidemic Fever of Burdwan. The opinion enunciated therein as to the primary cause of the fever, supporting as it does the views once before expressed to His Excellency the Viceroy by the Calcutta Missionary Conference, has had the effect of creating a deep impression upon him. His Excellency has accordingly directed further enquiries to be made on the subject, indicating by a series of questions the direction such enquiries should take. The value or wisdom of these enquiries in connection with the question at issue we need not here stop to discuss. It is, however, instructive to observe that the Lieutenant Governor now repudiates the charge of fathering Col. Haig's notion that "the fever is due in great part to poverty and over-population," and doubts the usefullness of the proposed enquiry in helping to throw new or additional light on the subject. His Honor says:

"With respect to the rest of your letter, I am to say that the Lieutenant Governor did not discuss Colonel Haig's view that the fever is in great part due to poverty and over-population, because he thinks it absolutely certain that, however these causes may aggravate and intensify the disease, it is a *specific disease* which marches over the country, whether there are or are not conditions, which we certainly cannot speedily cure, and which, when it does come attacks the well-to-do as well as the very poor. The Lieutenant Governor assumes, therefore, that we must do what we can to deal with the *specific evil* of the fever independent of such wider questions affecting the whole population in this and many other respects, which must at the same time have his very earnest attention. He proposes then to send the papers to the General Department, to which these wider questions belong, in order that the suggestions made may be there dealt with; this letter, therefore, is confined to the matter which appertains to the Irrigation Department."

The Italics are ours. We feel highly gratified at this significant change in His Honor's views, holding out, as it does, great hopes of this all-important question eventually meeting with a correct solution at his hands. We must confess that we are no admirers of consistency in regard to opinions once formed on questions like the one under review, inasmuch as, with our yet extremely limited knowledge of the laws of nature, any attempt at consistency on such matters is, in ninety cases out of every hundred, liable to degenerate into obstinacy. And we would much rather change our opinion twice in as many hours than close our mind against reason. All credit is, therefore, due to His Honor for the readiness he has manifested to mould his opinion on this vexed question according to the new lights that are from time to time being thrown upon it.

In para. 19 of his minute, dated the 14th instant, His Honor thus observes:

"I am very much struck, in comparing the population returns with the map, to observe that the highest population almost exactly corresponds with the tract marked by Colonel Haig in the deepest colors as most in want of drainage and improvement, and with a similar tract in Midnapore, which has similarly suffered from flood, and the difficulty of carrying off the water, as I myself witnessed a few months ago. Colonel Haig gives a vivid and, I may say, horrible description of the tract, as one in which there is absolutely no healthy flow of water whatever, and no escape—a hollow in which the water stagnates, and a mass of decaying vegetation festers in it; where noxious fumes exhale in the hot weather, while the damp of the raw cold weather and extremes of temperature then prevailing render it still more unwholesome. Yet, in these reeking swamps, the human race seems to have multiplied to a greater extent than anywhere in India—perhaps in the world. It seems as if it may be almost said that we cannot have too much water in this country, and that in such conditions in this climate, all sanitary science notwithstanding, the human race will multiply till it is wasted by great calamities. As it is, Colonel Haig truly observes that up to this time there has been much less fever in these reeking swamps than in the higher parts of Burdwan and Hooghly, where there is a sensible natural drainage."

Nothing at first sight is more paradoxical and yet more true, for nothing is more easy of explanation. These reeking swamps are just the places which are most favorable to the luxuriant growth of paddy, the staple food of the people, as it is also the most extensively cultivated crop of the country. The comparatively higher lands, which are in small patches scattered over the country, are, in no districts in Lower Bengal save Rungpore, and parts of Moorshedabad and Nuddea, high enough for cereals or other high-land crops, are yet too high for retaining the monsoon water essential to the healthy growth of paddy. Hence the former are preferred to the latter, and hence the density of population in those so-called reeking swamps. But we deny that there is less natural facility for drainage in those parts, though it may so appear to a foreigner unacquainted with the normal order of things in this country. In illustration of our position we would refer to page 8 to 10 of the pamphlet where it will be seen that those low lying tracts, which are likened to reeking swamp, while they are most favorable to the growth of paddy, are at the same time not devoid of the natural means of complete drainage, so far as the villages are concerned, unless the same is interfered with, as it has been in Hooghly and Burdwan, as also elsewhere where this kind of fever has epidemically broken out, as we have shown by citing numerous instances in the other parts of the pamphlet. Without fully subscribing to the statement of Col. Haig that as a matter of fact " there has been much less fever in these reeking swamps than in the higher parts of Burdwan and Hooghly, where there is a sensible natural drainage," we need only remark that those are just the parts, where impediments to the natural drainage of villages are more likely to be offered both by roads as also by the closure of khals than of those situated in low lying lands. In the low lying tracts, the roads, to be above the reach of inundation during the monsoon, must be constructed particularly high, and the expensiveness of construction prevents the multiplication of roads in such tracts. These roads, by their situation being also more liable to be breached and washed away, cost heavy sums in annual repairs. Hence it is that more roads are likely to spring up in higher than in lower tracts. Again as already observed monsoon water cannot be retained on those comparatively elevated lands, so essential to the healthy growth of paddy, unless the khals are kept closed, which, though favoring the growth of paddy, completely obstructs the drainage of the villages lying within those tracts as we have shown in the case of the sub-division of Jehanabad in page 12 of the pamphlet. It is not therefore so anomalous as it may at first sight appear that there is more fever in the higher parts than in the reeking swamps.

XII.

THE Godavari district in Madras is afflicted with fever of the same type, which is decimating the fever-tracts of Midnapore, Burdwan, Hooghly and other districts of Bengal. The Government of Madras has passed a Resolution on the subject, which runs as follows :

" The Governor in Council cannot but feel convinced that the deplorable prevalence of fever in the district is mainly due to the cause so forcibly sketched by Mr. Foster and Mr. Stuart—the utterly inadequate means of drainage in a tract of the country whose swampy nature has been aggravated by the great system of irrigation-works ; and he resolves to direct that this important subject be forthwith and most earnestly considered in the Public Works Department, and systematic arrangements be made, with the least possible delay, for remedying this most crying evil whereby at present the gift of financial prosperity, which has been bestowed on the district, is coupled with the course of disease. The Governor in Council cannot but feel that heavy responsibility rests on Government in this matter; and, as a practical step towards remedying the evil, he directs that a sum of one lakh of rupees be annually assigned in the Agricultural Public Works Budget for works of drainage in the Godavery delta, supplemental to the great arterial schemes that are already under execution, and that such additional aid shall be afforded to the District Engineer as may be needed in the way of subordinates competent to take levels for carrying out the works.''

In addition to the above, the Government has decided to extend the areas of the infected villages, and to allow remission of revenue for that purpose. So far the action of the Madras Government is commendable, and contrasts favorably with that of the Bengal Government.

The cause of the fever is, however, exactly the same, which is in active operation in Midnapore, "and not as the Madras Engineers suspect the "swampy nature of the soil aggravated by the great system of irrigation works." The truth of the matter is that the main irrigation channels and the distributaries are all embanked on either side as they must be to retain water for distribution—and wherever these embankments have crossed the drainage channels of villages, there the fever must have broken out. We explained this in our article on the epidemic fever in Midnapore in our issue of the 11th August last. The swampy nature of the country, as has been seen in Bengal, has nothing to do with the generation of the fever. We have demonstrated this by a mass of facts in our articles on the subject, and it has been testified to by such an eminent authority as Dr. Pettenkoffer, as will be seen from Dr. Salzar's letter given in the appendix. The unusual dampness of the houses in the fever-tracts bears incontrovertible evidence to this fact. Besides, the inhabited villages in Madras we infer are high, just as they are in Bengal, and the fever is in the house and not in the swamp. It is to be regretted that the English engineers, in constructing roads, railways, and canal embankments, pay so little attention to the natural drainage of the country.

While upon this subject we may as well notice a striking illustration of the Hon'ble Degumber Mitter's theory, which has presented itself almost under the very nose of our authorities. At the latter end of September last the same epidemic fever which has for the last 14 years been desolating some of the fairest and healthiest parts of Bengal, broke out most furiously in a village called Sibpore, which is situated over the water and nearly opposite the Fort, and enjoying the privileges and blessings of Municipal Government. For some days the number of deaths was more than thirty per day, and some idea might be formed of the virulence of the fever and the havoc already committed by it when we mention on reliable authority that in a particular locality of the village called Chowdhry Para nearly 25 per cent. of the population have been already carried away. The only sign yet exhibited by the local authorities of their knowledge of this terrible outbreak is the stereotyped order to clear the village of all vegetation, which, true to the saying মড়ার উপর খাঁড়ার ঘা or slaying the thrice slain, is being vigorously carried out. Now the real cause of the outbreak of the fever in Sibpore, as every where else is so plain and palpable that it must obtrude itself upon every man's notice, who would enter the village unless his eyes and ears happened to be absolutely closed. For as soon as you enter the village and express your wish to know if any physical change had taken place in it immediately before the outbreak of the fever, every child will tell you that a big drain traversing the place both north and south as well as east and west and which goes by the name of Chowdry's Gurh গড় has been filled up by or under the orders of the Municipality between April and June last. This big drain cannot also possibly fail to strike any man as being the drainage channel of the village, carrying the periodical monsoon rain-fall over the village through a culvert in the road to its outfall the Hooghly by means of a creek, which runs along the southern boundary of the Botanical Gardens. This drain as already observed was filled up between April and June last, and the epidemic fever true to the law which governs it as we have repeatedly shown in these columns broke out at the latter end of September following. We are aware that it is hard for our rulers, learned in the abstruse laws of nature, to swallow such a simple cause as this, explaining so important a phenomenon which has for the last 14 years eluded the grasp of their own scientific officers. But whether our lamentations are heard or not the very expression of them gives relief to our minds, and this is one excuse for recurring so often to the subject.

XIII.

THE report of the Sanitary Commissioner for Bengal for the past year contains a valuable paper as an appendix by Dr. Wilkie who was deputed to investigate into the causes of the Epidemic Fever in Burdwan. We are glad to find that he fully endorses the views so often expressed in these columns as regards the causation of the Fever. Dr. Wilkie says :

I believe that what was wrong with Hooghly and Burdwan in the fever years was the retention, in the surface soil above the clay, of moisture which ought to have been got rid of more quickly. In an ordinary year you have the rains, the consequent moistures of this surface soil, and the subsequent evaporation of the moisture with fever, until the soil, by evaporation and natural drainage, becomes dry. In a *jor bekar* year the same thing exactly went on ; but, as there was an obstruction to the natural drainage, the greater part of the moisture had to be got rid of by evaporation alone ; so that the whole layer of surface soil became damp sooner, evaporation began sooner and went on longer, and fever began sooner and went on longer. In fact, the most favorable conditions for the production of malaria were present, and their existence was unusually prolonged. As a natural result, the consequences of malaria were produced in a more intense form, in greater abundance, and for a longer period. Observations, such as those of Doctor Jackson, on the dryness of the soil to great depths in January, February and March, prove nothing at all, except that the soil is dry in non-fever months. However saturated the soil may have been in previous months, it cannot but be dry by that time under ordinary circumstances, because evaporation has been going on rapidly for months from the whole surface of the country, and the supply of moisture is not unlimited. No amount of obstruction to the drainage could keep the soil of Bengal moist throughout the year, unless frequent or heavy rains were superadded The remarks of the writer of the *Hindoo Patriot's* fever articles on this subject are to the same effect. In February 1872 there had been no rain for three months, and in February 1873 only 0·12 inches for three months. I have nowhere been able to find any mention of dry soilin villages in which the *jor bekar* was actually present at the time. Dryness of the soil is mentioned as existing in some places which *had* suffered severely. But what is wanted is a knowledge of the state of the soil when the fever was actually present. If any one could take us to a village stricken with the fever, and demonstrate that the soil is dry, there would be an end of the matter. All the observations of dry soil that I have read of were, as far as I remember, made in places not at the time of suffering, and made at a time when the soil of the whole country is necessarily dry.

"It is indeed greatly to be regretted that it should be possible to throw any doubt on the matter, that the question of the increased dampness of the soil, and longer duration of that dampness in places afflicted with the *jor bekar*, should not have been thoroughly investigated at the proper time, for no observations made now can show what the condition of the soil was then."

Any one reading the above paragraphs with careful attention will at once see that the views enunciated in them are reducible to the following propositions.

1st. That the fever met with in the epidemic districts is not new to the country but is precisely of the same character which breaks out every year, though in a mild form, after the close of the rains.

2nd.—That the fever is malarious in its nature and is caused by the humidity of the soil.

3rd. That the fever which is endemic to the country on account of the heavy periodical rainfall and in spite of the facility of natural surface drainage enjoyed by the villages, assumes an epidemic form where an obstruction is offered to the natural drainage.

4th. That the fever abates or entirely subsides as the soil becomes dry with the setting-in of the hot weather.

5th. That the increased dampness of houses in villages where the fever rages epidemically as testified to by Mr. Metcalfe can only be due to damp soil.

We will now quote from a pamphlet, which was issued some time ago from this press, being a reprint of the fever articles that appeared from time to time in this journal, in order to show how completely Dr. Wilkie supports the views entertained by us upon the subject.

" It should not be forgotten also that every village in Lower Bengal is more or less humid after the cessation of the rains from the beginning of October to the middle of December, more so than during the continuance of the rains, and fever, precisely of the epidemic type, though not in an aggravated form, is more or less rife throughout Bengal during those months, than at any other time of the year. Hence the period is characteristically described in our country by the term of Jamashtaka—meaning that during that period all the eight portals of the mansion of Pluto are open to receive the dead. The same cause, therefore, which under its normal condition favors the advent of the intermittent, type of fever every year in a mitigated form, when intensified. as would necessarily be the case when the humidity of the soil is aggravated by obstructions offered to the surface drainage of a village during the rains, and thereby allowing it to be wholly absorbed in the sub-soil, would usher in the fever in an epidemic form. We would entreat those who are engaged in enquiry into the cause of this epidemic to bear this significant fact in mind, inasmuch as all their investigations are sure to prove disappointing, if they start with an idea that the fever met with in the epidemic villages is a stranger to the land." (page 37.)

"It will be thus seen that places, otherwise similarly situated or rather more favorably situated for the propagation of the epidemic, have nevertheless escaped it, only because the road has not extended into them, and their drainage has not been interfered with. As for facts tending to show that places, in every respect similarly circumstanced, have yet escaped from the consequences thereof, we are not aware of any; nor, in our opinion is such a contingency possible; when it is our firm belief, induced after a careful analysis of a number of facts during the last ten years, firstly, that the type of fever met with in the epidemic, district is solely due to some thing in the soil—and the condition most favorable to the development of *that* something, is excessive or abnormal humidity of the subsoil; secondly, that when such estate of the sub-soil is not the normal condition (in some places excessive humidity is natural, owing to the extreme porousness or some other peculiarity of the soil, as in the case of almost the whole district of Rungpore, where consequently this type of fever rages endemically), the cause which operates most powerfully to produce that condition is impeded drainage; and thirdly, that it is the inordinate humidity of the sub-soil of towns and villages and not of the paddy fields and jullas, which contributes to the outbreak of the fever with epidemic intensity. Strange as it may appear, it is not the less true, that the fact, that the natural drainage of a Bengal town cannot with impunity be interfered with, which of all others should have forced itself generally into notice, is yet just the one which is least generally known or recognized—and it is to this ignorance or indifference, that is to be attributed, the ruin of many flourishing cities and towns both in earlier and later times." (page 16.)

"The extreme dampness which the houses in the epidemic-stricken villages present—houses which were heretofore noted for their dryness—and the disappearance or stunted growth of such of the vegetable species, as are partial to a dry soil (*assaura* and the like), and the luxuriant growth of others habitually fond of a moist soil (such as Belati Bharanda), are, we think, unmistakable evidences of the fact, and we fully agree in the statement quoted above that the mischief has been committed chiefly by roads, railways and embankments, not because as such, but because they have happened to cross the drainage levels of villages." (page 12.)

"What is so carefully held in store for the nourishment of the rice plants, must be as carefully let out of the villages, or the fever, which, as we have before observed, is endemic here from October to the middle of December, will assume an epidemic form. To account for the epidemic you are not therefore to look to the soil of the rice-fields, or of the Beels, but to that of the villages themselves—and if it is water-logged, the true remedy as in the other case, is to be found in the removal of the obstructions which have been offered to the drainage course of a village, and not in sub-soil drainage. For, however, humid or water-logged the soil of a village may be, it will under the scorching sun, and without the aid of any sub-soil drainage, be perfectly dry by April, when also, epidemic fever, however virulently it may have been raging, will of itself begin to abate. To prevent a recurrence, we have only to restore the natural drainage of the villages, and they will without any other treatment return to their normal condition. In fact the application of subsoil drainage to Bengal with its periodical rain-fall of 80 inches, the rivers full to overflowing during the monsoon, and three-fourths of its arable lands under water at least during four months of the year, and relying upon it as a sovereign remedy for the eradication of the disease, appears to us as reasonable as the conduct of the man who waited in expectation of fording the river when it would become dry during ebb-tide. The undertaking recalls to our mind the feat of our ancient sage Agasttia, who is said to have brought the sea into the hollow of his palm and then drunk it off." (page 41 and 42.)

It is highly gratifying to us that the conclusions arrived at by Dr. Wilkie after an independent and searching enquiry should in such a remarkable manner coincide with the views advocated in these columns for the last ten years. We will conclude this article by making one more extract from Dr.Wilkie's paper anent the fever which broke out in Sibpore (a village situate opposite the Fort) in September 1873. In our article on the subject we remarked that the outbreak of fever was entirely due to the obstruction offered to the drainage of the village by the filling-up of a large ditch which went by the name of Chowdry's Gurh. It so happened that the Gurh in question was filled by the Municipality in 1873 before the setting-in of the rains, and the fever broke out in a virulent form in the same year after the close of the rains, illustrating in a remarkable manner the truth of the following observations of Baboo Degumber Mitter. (quoted on page 5.)

"I may here remark that the face of the country being perfectly flat, the drainage runs over the whole surface towards the direction of its slope, and consequently roads running transversely to it must of necessity intercept the drainage. Both the East Indian and Eastern Bengal Railways are provided with capacious viaducts wherever they have crossed what appeared to the eye a water-course, but these are in reality khals and other large streams, which, as I have already observed, received drainage in its flow from the villages over paddy-fields and bheels. The latter (paddy fields and bheels) exhibit no visible signs of their being water-aways, and could not be known as such unless narrowly watched during the rains, though a road crsosing them would more effectually shut out the drainage, and the evil consequences resulting therefrom would be much sooner felt, then when it crossed distant channels."

Dr. Wilkie continues. "Without at all noticing the striking fact of the interference with the only drainage channel of a large portion of Sibpore being immediately followed as 'an inevitable consequence by the breaking out of fever in a virulent form, or in any way controverting the fact, Dr. Jackson attempts to impugn the theory propounded by Baboo Degumber Mitter by simply denying the presence of humidity in the subsoil of Sibpore, as if it were possible that a Bengal village, having a periodical rainfall of nearly 70 inches within three or four months should not be saturated with undue moisture when its natural channel of drainage has been suddenly interfered with." The following quotation from Dr. Wilkie's paper gives the statement made by Dr. Jackson with regard to the condition of the sub-soil of Sibpore and mark the curt manner in which he has disposed of it.

"At page 92 of Dr. Jackson's sanitary report for 1873, the Civil Surgeon of Howrah, speaking of fever that was present with special force and fatally during October, November, and December in Sibpore and Belgatchia villages within the limits of the municipality, says: (The disease appeared and raged in a most arbitrary manner, and it may be noted that the drinking-water theory and the subsoil water theory failed to explain the phenomena. In sections where the disease prevailed, the drinking-water appeared to be quite as good as in other sections where the endemic did not prevail more than in ordinary years, while the sub-soil-water was unusually low during the past year.' And again, on the same page: (Supposing that a water-logged condition of the soil could produce fever, as maintained by Baboo Digumbur Mitter (and this has by no means been proved) it certainly could not have been the cause which originated the fever at Sibpore, or maintained it after it was originated, because the subsoil water has been lower this year than it was in the corresponding months of any year since 1860.)

" Were the subsoil water observations made in Sibpore itself, or were the subsoil water readings taken in another area of the municipality not affected with fever, applied to Sibpore, affected with fever? To be of any value, such observations should be made in the place actually affected. Local conditions may produce great differences as to moistness of the soil between places quite near each other."

XIV.

The last number of the *Calcutta Journal of Medicine* contains the Essay on the Epidemic Fevers of Bengal by Assistant Surgeon Babu Unnodapersad Kastugiri, to which has been awarded a portion of the prize offered by His Excellency the Viceroy. We are glad to observe that as regards the causation of the fever the earned doctor has not felt it derogatory to his dignity as a scientific man to accept in its entirety the theory, which we have been supporting in these columns ever since the appearance of the report of the Epidemic Commission in 1864. After a careful and searching local enquiry Babu Unnodapersad Kastogiri comes to the conclusion that the fever is due exclusively to the abnormal humidity of the subsoil of *villages,* not of paddy fields, caused by obstructions offered to their natural drainage "by bunds, embankments or railway lines," and we are glad to observe that unlike others of his profession he has not invoked to his aid some one or other of those mysterious agencies, of which the propounders of the theorist seem to have no clear conception, and which have not the remotest connection with the phenomenon in question, even if their existence were not quite apocryphal. The following extract from the essay shows what the writer considers to be the cause of the fever :

> "These fevers are due, in my humble opinion, to exhalation of malaria at certain periods of the year, or during a succession of years, from excessive moisture of the soil or subsoil, close to human habitations. The *moisture* is caused by obstruction to the water-courses, or natural drainages of villages by Bunds, Embankments, or the Railway Lines. Silting of rivers either at their points of origin, course, or termination also gives rise to malaria, and its effect the out-break of fever, is either Endemic or Epidemic, and of a slight or severe nature, according as the obstruction is permanent, temporary or periodic, and also as the particular soil is more or less retentive of moisture, and the solar heat is slight or severe in degree. In other words, the generation of malaria or the fever-poison of Bengalis is in direct proportion to the moisture of the soil, and the atmospheric temperature, or solar heat causing its evolution from the said soil. The so-called epidemic fever of Burdwan and Hooghly has been raging for upwards of 10 years on both sides of the river Hooghly and in other places. Since, 1868, it has appeared in Burdwan, and Hooghly, and latterly in Midnapore also."

We need not quote from our own articles to show that this is precisely the theory advocated by us in these columns, and which was enunciated by Baboo Degumber Mitter as a member of the Epidemic Commission, and embodied in his notes published as an appendix to the report of the Commission.

The essayist has cited many instances of villages, wherein obstruction to drainage and the appearance of the fever in an epidemic form have followed each other as cause and effect. We will, however, make one extract which illustrates in a striking manner the theory we advocate, as being sufficient by itself to account for the outbreak of the fever in an Epidemic form. We will first give an extract from our pamphlet:

> "We will conclude these remarks for the present by giving an instance of how an important town has partially recovered by the partial restoration of its natural drainage. On the south and west of the river Bhoirub is situated the town of Jessore with its drainage receptacle, the Bheel Harina lying to the south west of it. A road, called the Dacca Road, constructed, it is said, about 60 years ago, runs along its south and western boundaries, intercepting the drainage of the town in its way to the Beel. How unhealthy Jessore has been for a long course of years is well known. Although we cannot ascertain the exact year in which the above road was constructed, yet we make ourselves bold enough to say that the unhealthiness in question dates within a year or two of the construction of the road. The correct information on the subject cannot, however, be unavailable to the Public Works Department, and we shall be glad to stand corrected in the matter. Cholera is said to have been first introduced into this country from Jessore, and its hand-maid, the malarious epidemic fever, after committing a frightful havoc about fifty years ago, settled down in Jessore endemically at Cossimbazar and its neighbourhood. Not a soul could be met with there who had not a sickly tumid belly and lanky extremities to present All the laws of sanitation known to the authorities from the filling up of holes and dirty tanks to the cutting up of jungle, had been experimented upon, and exhausted. So much so that, with the exception of a few cocoanut trees, not a single old tree of any kind could be met with in the place within a few years of the breaking out of the disease. The natural drainage course of the place, when intercepted by the intervention of the road in question, had been attempted to be diverted towards the river on which the town is situated, but ineffectually, as the river was not tidal there and was so constantly full to overflowing during the rain, that, instead of receiving the drainage, it would very often inundate a portion of the town itself. Thus a new evil was brought on and the authorities, leaving aside the question of sanitation, had to direct their attention as to how to protect the town from inundation. Towards the latter end two drains were caused to be excavated running parallel to, and at some distance from each other, and connecting the river Bhoirub with Beel Harina, thereby affording a vent to the overflow of the river into the Beel. But the drains, in their course to the Bill, passed through the town, and thus the natural drainage of the place which had been obstructed by the Dacca road was accidentally, though as yet

partially, restored. The immediate consequence was a considerable improvement in the sanitary condition of the town which has lasted ever since. No one that we are aware of has noticed this; and there may be persons disposed to attribute the improvement to tank-filling, jungle-cutting, and other forms of folly and extravagance which have acquired such unenviable notoriety of late. The improvement, however, will be only complete when the drainage channels of the place, which are yet directed towards the river, are diverted to the two drains." (p. 21, 22.)

The quotation shows that we did not know at the time we had penned the above when the Dacca road in the course of its construction passed along Jessore, but from its situation it was quite clear to us that it must have completely shut out the drainage of Jessore from its natural outfall the Beel Harina. Such being the case we had no hesitation in asserting positively that the abnormal unhealthiness of Jessore must have dated from within a year or two of the construction of the road in question. The following quotation from the essay supplies the information we sought for verifying most completely what we had as confidently asserted in the above extract as having caused the obstruction to the drainage of Jessore and the consequent outbreak therein of the epidemic fever. Babu Unnodapersad Kastogiri says:

> In 1834-35 the Government commenced the construction of a road from Fureedpoor to Jessore by convict labour. In 1836, the road progressed as far as Mahmoodpoor, between it and its drainage outfall into the Keshwar Bheel, as far as Harekistopoor a mile to the south-east of Mahmoodpoor. Fever of a virulent type broke out after the ensuing rains, both in Mahmoodpoor and among the 700 convicts working on the road; of the latter 200 are said to have died in a short time, on account of which the work was abandoned. Mahmoodpoor was entirely deserted. It is now an insignificant village still containing many remnants of its old magnificent buildings.
>
> On the Nuddea side, the road mentioned before, had progressed as far as the Sudder Station of Jessore on its south, cutting off its drainage outlet into the Harina-Bheel, when fever of a destructive character broke out there. In short, the Road, popularly called the *Dacca Road*, brought disease and death along its progress into the villages, the drainage of which it obstructed, a positive fact in support of the obstruction of drainage and of out-break of severe fever, following each other as cause and effect.

The above shows that it was not in Jessore alone that the fever broke out in a virulent form, but also in other places the drainage channel of which had been likewise intercepted by the road in question. The following extract from Mr. Westland's report on

Jessore given in the report of the Sanitary Commissioner of Bengal for 1874 fully confirms the statement of Babu Unnodapersad about the year the road was constructed. Mr. Westland says, "great sickness broke out here in the year 1836 when the Jessore and Furreedpore road was being constructed by means of convict labour. It was a fever begun with a headache causing internal heat and carrying off the victims in about 10 days. It continued here seven years and desolated the place." (Westland's Report page 273.) This concurrence of testimony is highly gratifying.

APPENDIX.

I.

Reprinted from the appendix to the Report of the Epidemic Commission published in the Supplement to the Calcutta Gazette, 20th April 1864.

Statement furnished by Babu Degumber Mitter relative to the epidemic fever at Cossim Bazar and the neighbouring villages.

* * * * * * * * *

CHOONAKHALLY, Bhautpara, Cossim Bazar, Kalkapore, Bamunghatta, and Furreshdanga were situated on a curve of the River Hooghly until a straight cut was made some sixty years since forming the chord of the curve, thus changing the course of the river and throwing those places inland. This engineering operation was closely followed by the breaking out of an epidemic in all those places which, in its virulence and mortality, is unparalleled by any pestilential visitation in Bengal, saving perhaps that which depopulated Gour.* During its rage cremation or burial in due form was found impracticable, and the dead are said to have been carried in cart loads to be disposed of any how ; and thus the City of Cossim Bazar, once noted for its commercial importance, the extent and magnitude of which is said to have called into existence upwards of a hundred shroffs or banking firms to meet the monetary requirements of the same, was reduced, within the short space of five years, to almost a deserted waste.

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* It is highly probable that the long continued pestilence which necessitated the removal of the seat of Government from Gour to Tanra was caused by interruption in the drainage of the city. The heavy embankment on the margin of the lake or bheel on its eastern extremity, while guarding the city from inundation, must have effectually shut out the drainage in its flow into the lake.

This fever continues there to the present time, shewing that its causes are still in active operation. In other respects Cossim Bazar does not at all differ from any healthy Town in Bengal. Its waters, vegetation, houses, and the mode of life of its inhabitants are exactly alike ; but no man sojourning there even for a day can help being struck with the extreme dampness which is felt even during the hottest months of the year. This dampness can only arise from excessive moisture in the sub-soil, owing to the disturbance in the drainage of the place, occasioned, most probably, by the diversion in the course of the river, aided perhaps by a number of roads running transversely to the direction of the drainage. How caused it is not easy at this distance of time correctly to trace, and perhaps immaterial to our present enquiry. Enough that the place is extremely damp. This is undeniable, and I think it is likewise undeniable that this extreme dampness is owing to an excess of moisture in the soil.

* * * * * * * * *

Memorandum supplied by Babu Degumber Mitter relative to certain obstructions to the drainage of the epidemic Districts.

THE drainage of all the villages in the epidemic Districts, as elsewhere in Lower Bengal, is effected by the water first running into the nearest *paddy fields* lying in the direction of their slope, thence it collects in the *bheels* from which it rushes through *khals* into larger streams, which again communicate with navigable rivers. An obstruction occurring in any one of these conduits must interfere with the drainage, and its effects are felt more or less according to the proximity or remoteness of the obstruction from the scene of its influence. Accordingly it has been found, as will be noticed more particularly hereafter, that the stoppage of the mouths of the different streams has not been productive of such serious consequences to the villages lying within their influence as when the same occurred more in the vicinity of those villages.

The obstructions appear to have arisen chiefly from roads and partly from embankments thrown up across khals for purposes of fisheries. I had neither time nor opportunities at command to trace in every instance how, and when, the stoppage had taken place, enough however, has been discovered to satisfy me of the correctness of my general conclusions.

The banks of large rivers as a rule being always high, the slope of the villages situated on either side of the Hoogly runs inland. Accordingly the drainage of all the villages from Trebeni to Nasurye, as also of those lying more inland, at one time passed over the adjoining paddy fields to the west into the River Koontee through the Jhenook Khalee Khal. On either side of this khal are beds of sand of a superior quality, which is extensively used for building purposes. In the process of excavating this sand a large quantity of surface earth is thrown up and deposited close to the bed of the khal, and being gradually washed into it has caused some obstruction in that channel. The mouth of the Koontee again, called Nasurye Khal, has since several years considerably silted up, closing its navigation soon after the rains. These stoppages, though interfering to a certain extent with the drainage of the country, did not produce any serious consequences. About five years since, however, a road was run by Baboo Mudoosoodun Nundy (unprovided with a single bridge) from Mugra to Nasurye, crossing the water-course and thereby completely intercepting the drainage of all the villages noticed above in its flow into the Koontee. This resulted in the breaking out of the epidemic a year or two after almost simultaneously in all those villages. In the same manner Joypore, Bagaty, and the other adjacent villages were attacked; soon after the village road from Trebeni to Mugra was raised and metalled without any outlet being kept across it thus stopping the drainage of those places, which, when the road was kutcha and on a level with the country, flowed over into the Koontee.

A road from Rajhat to Dwarbashini crossing a bheel, where the drainage of the latter place used to collect, has stopped its passage into the Kadermuttee. There is an apology for a bridge constructed, the ryots said, about two years since, but I was satisfied by personal observation that it was quite insufficient to afford free passage to the drainage of the place, as large collections of water in the bheel itself at a time of the year when even large tanks begin to dry up otherwise fully proved. The result is that a violent epidemic has been raging in Dwarbashini since August last. Again, the Unjona, which was at one time a navigable stream during the rains, carrying in its fall into the Matabhanga the drainage of a number of villages in the vicinity of Kishnaghur, has silted up at both the ends since fourteen years, yet none of the villages of which it was the main sewer suffered therefrom. A kutcha road, however, running from the Barobazar of Kishnaghur to Lollbagaun, crossing the water-courses of Baroepara, has been raised within the last two or three years, completely intercepting the drainage of that village, which had hitherto flowed over it into the paddy fields ; and it has been followed by the breaking out of a fearful epidemic in Baroepara since August last.

In like manner the Eastern Bengal Railway and its feeders, when the same have crossed the water-courses of villages lying on the eastern bank of the River Hooghly, and of others more inland, but situated to the west of the line, have obstructed the drainage of those places; the fall of the villages lying on the eastern bank of the Hooghly, as I have before observed, being towards the east, and consequently Chagda, Kauchraparah, Halisohur, and many others similarly situated have suffered.

I may here remark that the face of the country being perfectly flat, the drainage runs over the whole surface towards the direction of its slope, and consequently roads running transversely to it must of necessity intercept the drainage. Both the East Indian and the Eastern Bengal Railways are provided with capacious viaducts whenever they have crossed what appeared to the eye as water-courses ; but these are in reality khals and other large streams, which as I have already observed, received the drainage in its flow from the villages over *paddy-fields* and *bheels*. The latter exhibit no visible signs of their being water-ways and could not be known as such unless narrowly watched during the rains, though a road crossing them would more effectually shut out the drainage, and the evil consequences resulting therefrom would be much sooner felt than when it crossed distant channels. Taking into consideration the number of roads which have sprung up of late as also others in course of construction, and bearing in mind likewise the manner in which the drainage of the country is effected, and the difficulty thereby entailed of providing those roads with a sufficient number of outlets, it is not improbable that in the cases of those villages which have not yet been examined, obstructions to their drainage would, upon enquiry, appear to have proceeded chiefly from roads having been made without reference to the watershed of the country, and without being provided with a sufficient number of water-courses.

II.

(From the Indian Medical Gazette, June 1872.*)*

REVIEW.

The epidemic fever in Bengal, reprinted from the Hindoo Patriot, 1872.

Whenever any plague, pestilence, or famine visits this earth of ours, there immediately springs up a mushroom crop of theorists, who would account, each after his own fashion, for the phenomenon. First come the supernaturalists, who assign the event to the wrath of some offended God or Gods, on account of sins, real or imagined. The "sins of our rulers" is the most favorite formula in India. Next come the transcendentalists, who attribute the circumstance to some general influence, sideral, planetary, solar, luner, or atmospheric. They strive to establish by means of symbols a coincidence or consequence, and endeavour to explain exceptional and partial manifestations by an assumed general influence. The more removed the "theory" is from common occurrence and observations, the more learned its aspect and mathematical its attempted demonstration, the less its title to serious thought or criticism. The fact that the operation of the so-called cause must be equal and universal, and the circumstance that the reported effect is unequal and partial are, *a priori*, sufficient warrant to receive " theories" of this sort with very great hesitation, if not contempt. Then come the pseudo-inductionists, who with a flimsy array of proof parade a specious argument or opinion whose most remarkable attribute is the assurance with which it is enunciated. Of this class there are several orders. There are the institutionists—men of the Joe Bagstock stamp —" sly, sir, devilish sly," who evolve explanations out of their own consciousness and blare them forth oracularly; there are the *ipse dixits*, who substitute strength of asseveration and continual dogmatic repetition, for soundness of either facts or logic ; there are the hobby riders, who see in the novel circumstances only a new field for giving their nag a canter ; there are the plagiarists—men of the vampire breed—who filch modest working men of their information, and give it out as their own with an air of wisdom and learning. Space would fail us were we to attempt an exhaustive catalogue of theory-mongers. Their common characteristic is a combination of ignorance and conceit, and the best mode of dealing with them is silent contempt. Lastly come the genuine workers men who strive rather to allow honestly collected facts beget their own generalizations, than subordinate facts to a preconceived conclusion. Such men are modest, laborious, and cautious, ever doubting and enquiring, who accept nothing which does not bear the stamp of genuine research, and who will rather spend a lifetime in unravelling a difficulty by patient investigation, than violently suppress it or ignore its existence.

The "epidemic" of fever which has during the last twelve years, been prevailing in some of the districts of Lower Bengal, has been no exception to the rule above stated, and " theories" have not been wanting which would account for its existence and peculiarities. It is not our intention to enumerate or review them, and shall confine our comments to the pamphlet whose title we have cited.

This little work is a reprint of five articles which appeared recently in the *Hindoo Patriot*. These articles were written, the preface tells us, " with a view to defend the position assumed by the Hon'ble Degumber Mitter in his minute on the subject, which was published as an appendix to the report of the Epidemic Commission of 1864." This position was, that the so-called epidemic fever is due to an obstruction of the surface drainage of villages, caused mainly by the construction of roads, railways, and embankments, without a sufficient waterway for the ready discharge of rain and flood. These articles have evidently been written by a native of Bengal, familiar with the conditions under which the people of the fever-infected tracts, live, and, without any pretence to scientific knowledge, they abound in shrewd observation and apt illustration. The writer believes that the " question of fever causation is one which does not lie beyond the domain of common sense ;" and, as a native of the country, he asserts that his" opportunities for the collection and digestion of facts likely to lead to a correct solution of the question at issue, are much greater than those possessed by a foreigner to the country, however qualified he may otherwise be for the conduct of such an enquiry (page 61.) The system of natural drainage of Lower Bengal is described with accuracy. " The drainage of all the villages in the epidemic districts as elsewhere in Lower Bengal, is effected by the water first running into the nearest paddy field lying in the direction of their slope ; thence it collects in the *bheels* from which it rushes through *khals,* into large streams, which again communicate with navigable rivers. An obstruction occurring in any of these conduits must interfere with the drainage, and its effects are felt more or less according to the proximity or remoteness of the obstruction from the scene of its influence" (page 6.) Villages are thus shown to be situated on the highest level which can be found, and their surface drainage finds its way to the nearest paddy fields and *bheels.* Two important circumstances are pointed out ;—1*st,* that as an invariable rule, the drainage slope of river banks is *away from the river ;* and 2*nd,* that in order to judge rightly of the channel and directions in which the surface drainage of villages is effected, it is necessary to study them during the rains, and when the water actually being drained off them in bulk. An inquiry during the dry months, after the water has drained off is sure to lead to imperfect results. Superficial observations may suggest that villages lying on the river side of a road, railway or other embankment, cannot possibly suffer from an obstruction of drainage caused by an impediment to landward of them; but the fact above-mentioned, which may be accepted as well established and invariable, proves the absurdity of such a position, which has actually been maintained by engineers; and others more than once. Numerous illustrations are given in detail in proof of the writer's contention. They are related very circumstantially, and carry strong presumption in favor of the accuracy of the views maintained, if not positive demonstration. Instances are given of roads and embankments being recklessly constructed across a line of country, so that the surface drainage of a series of villages has been interrupted. A virulent outbreak of fever is said to have followed, while another series of villages lying beyond the influence of the road or embankment, and precisely similarly circumstanced in every other respect, has escaped. The best illustrations of this sort are those referring to sundry places in the Jehanabad sub-division of the Burdwan district. Evidence is adduced that the epidemics which depopulated the famous city of Gour, the English settlement of Cossim Bazar, the Dutch settlement of Kalkapore, and the French settlement of Furrasdanga, were caused by the construction of roads and embankments across the line of surface drainage. Instances are also given where the removal of the obstruction, either by the natural agency of the obstructed water (page 42), or by art (page 35), has been followed by an improvement in the health of the villages whose drainage had been closed, and others of exempted localities in the midst of fever tracts whose drainage has not been implicated. Evidence of this sort is very valuable. The writer goes so far as to say, that no place, whose drainage has been thus obstructed, has ever escaped a visitation of fever; and he even prophesied an outbreak with confidence which, he alleges, occurred according to his prediction (page 58). It appears to be a matter of common observation that the places affected with this "epidemic" have become *damper*. The people assert it; other observers (Mr. Metcalfe and Dr. Gupta) have recorded the circumstance; the walls and floors have become moist, and the people have been compelled to lie on *charpoys* (bed-steads); plants growing in a dry soil have died out, and others thriving on a moist soil, have flourished (page 14); and records which use to be kept in holes in the mud walls of houses without harm, have now to be suspended from the roof. So far we have followed the writer of this pamphlet who supports his particular view with much ability and force. He asserts that the fever is but the usual malarious fever of the autumn months, accompanied with splenic complications, and caused by the telluric poison arising when the soil is in process of drying. He shows that mere humidity or the presence of water or moisture is not enough to cause this fever. People remain healthy during the rains when the land is under water and the atmosphere saturated with moisture, and villages situated close to *jheels*, perennially under water, are healthier than others *apparently* drier. It is a moist and drying soil that occasions this fever. In all this we entirely concur, and we subscribe a general adherence to the theory which this pamphlet expounds; but we think that the writer has under-rated the effect of natural changes in rivers and levels occasioned by spontaneous deltaic alterations. The obliterations of such a river as the Kanna Nuddee cannot occur without most important effects on the drainage of villages and fields. The writer asserts that, if, river changes were the cause, then a general out-break throughout all the villages under the drainage influence of the river would follow. We admit the force of this observation, but still contend that as different villages, differently circumstanced and conditioned, must have a more or less perfect system of natural drainage, so they must be more or less affected by a general obstruction. We would simply place obstructed and obliterated rivers as a cause of impaired drainage. We cannot follow the author of this pamphlet into all the subjects he has broached. He treats the jungle cutting and tank clearing and the sub-soil draining cures with scorn. As long as the physical geography and rice cultivation of Bengal remain what they are, so long must there be at certain periods of the year water-logging and subsequent drying. The great object seems to be to remove the water speedily from villages *always* and from rice fields when it is no longer wanted, and to prevent stagnation *to minimise the fever period.* He even doubts the advantage or profit of draining *jheels*. The " travelling theory" is also handled roughly.

On the Malthusian hypothesis he has the following pungent remarks. After quoting Colonel Haig's exposition of the view he writes:

" We know not which to admire most the perfect simplicity with which the theory involved in the above passage, has been broached or the gravity with which it has been worked out; and if we take the whole to be a burlesque, or a travesty, of what has been heretofore said on the subject, it is because it surpasses our belief that any sane man would seriously think that the exciting cause of the epidemic fever was want of sufficient nourishment, much less a person of the power of observation and intimate knowledge of the country like Colonel Haig. However, since it has been started in a grave official document, and the suffering of the people in the affected districts may be intensified by hasty and inconsiderate action founded on it, we feel ourselves called upon to enter our solemn protest against it. We believe a greater mudde in the name of science has seldom been presented to the public than in this nebulus of high rent, failing stamina, weakened vital energy, and difficient food-supply to account for a local complaint, increasing and decreasing without any reference to the rise or fall of food-grains. If there be any truth in the idea of difficient nourishment and epidemic fever being related to each other as cause and effect, how was it, we may ask, that the fever did not make itself manifest when its alleged cause was in operation with greatest force and intensity in the Orissa districts during the famine year of 1865-66. The whole province of Orissa is essentially a rice-growing country, more so than either Hooghly or Burdwan; and a famine broke out at a time of the year when miasm was most abundantly propagated, *viz.*, during the close of the rains; and yet amongst a million of deaths, which must have occurred within the short period of a year, not a single case was known to be preceded by or accompanied with any of the symptoms, which are invariably attendant on the epidemic fever, wherever and whenever it breaks out in this country. But even in the case of Hooghly or Burdwan, does not the unanimous testimony of all medical men show that the epidemic is quite impartial in the selection of its victims, and that wherever it breaks out, it spares neither the rich nor the poor. Is it not a notorious fact again, that in both those districts, out of fifty villages within a given area forty are attacked, and 10 have entirely escaped. If so, is it to be supposed that the people living in the favoured ten are the only well-fed out of all those who occupy the 50 villages within the given area."

"We are afraid Colonel Haig has not also made a correct use of his statistics in drawing his conclusions about the insufficient food-supply of the district. Colonel Haig, to be on the safe side modestly assumes for his calculation the population at 940 per square mile instead of 1,045, as obtained from the last census returns; but taking the population even at the higher figure, and admitting, for the sake of argument, that the staple food-crop of the country, *viz.*, paddy, raised from a square mile of the country, is insufficient to sustain the population thereof, we would take the liberty to remind him that, unlike most other districts a large area of Hooghly is under the cultivation of the sugar-cane, potato, and other valuable crops—the net return from a bigah of which is six times that of paddy: it would be as reasonable to infer from this condition of things that the population of the Hooghly district suffers from insufficiency of food as to assume that certain department of France and certain counties of England did so, because the wheat crop there has been supplanted by hops and vine. If the primary object of Colonel Haig be to augment the food-supply of the country, he would have a much surer basis to work upon, and his efforts would be more likely to be crowned with success, if, instead of wasting his energies on the marshes of Hooghly, he would direct his attention to the reclamation of the unappropriated lots of the Sunderbuns. With a fourth of the proposed outlay, we can assure him, he will supply the country with treble the quantity of paddy he estimates from the marshes of Hooghly."

We have read this pamphlet with much interest. As a sensible exposition of the drainage theory, and an able statement of the causation of the " epidemic fevers of Bengal" from the point of view of the inhabitants of the country, it is most valuable, and no one should presume to write on the subject without having carefully studied it.

III.

To the Editor of the Indian Daily News.

SIR,—With reference to your article of this day on the Honorable Degamber Mitter's theory of the causation of the Burdwan fever, it may be of some interest to those of your readers who concern themselves about the subject to learn that Dr. M. Von Pettenkofer of Munich, to whom I sent the pamphlet treating of this question, expressed in his reply a very high opinion on the Hon'ble D. Mitter's theory which he hopes will, both in the interest of science and humanity, be put, without delay to a thorough-going test.

Want of time prevents me for the present from giving a translation of the letter in its entirety, although there are some careful remarks in it of a general character. The following has a special bearing upon the question :—

" To me, as to the author, it always appeared that the dwelling ground of the people has much more to do with the origin of the disease than has the surrounding district or land (as rice-field, marshes &c.)" and further on " Dr. Douglas Cunningham of your place know my views about the influence of the condition of soil and moisture on Cholera ; he, I dare say will not be slow in giving the subject all the attention it deserves."

Yours &c.
(Sd.) L. SALZAR.